HORTICULTURAL ABSTRACTS

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SALIENT ITEMS, Vol. 29, No. 4.

ENVIRONMENT

Soil:—New books are available on soil conservation (4128) and on soil-water relationships (4131). A method is described by which soil quality is determined from the percentage of seedlings that emerge (3547). Anthraxylates, produced from coal, may prove a useful soil amendment (3669).

Temperature:—With tomatoes an interaction occurs between soil temperature, soil structure and P uptake (3695). With peach seedlings comparatively small differences in temperature may have large effects on the development of physiological dwarfing (3231). In kalanchoe plants resistance to high temperatures varies at different times of the day (3908). In vines frost-resistant varieties are characterized by the early accumulation of starch in their tissues (3344), and in apples by a high content of protein-bound arabinose (3238).

Relative humidity:—Apple fruit size influenced by (3279).

GROWTH AND REPRODUCTION

Shoot and leaf growth:—Waxing dormant rose bushes may result in substantially greater growth in the next season (3911). In apple trees branches with narrow-angled crotches grow faster and break more readily than branches with wide-angled crotches (3268). In beans high yield is associated with a large, but not with a very large, leaf area (3607). Sphaeroblast enthusiasts may be interested to read of their occurrence in citrus trees (3964).

Pruning wounds:—Bark-patch grafting as an aid to recovery (3921).

Root growth:—Given suitable conditions the roots of top and small fruits may grow at any season, but there are usually one or more seasonal flushes of higher activity (3233). In tobacco the lower leaves are nourished by the tap root and the upper by adventitious roots (3753). In coleus the transpiration rate and the size of the root system are interrelated (3142).

Flower bud initiation and development:—It has been emphasized in the past that the factors that stimulate the initiation of flower primordia and those that encourage the subsequent differentiation and development of flower buds appear to be distinct in most, if not all, plants. Further evidence on this subject is provided by several papers (3234, 3235, 3940, 4006). Where regulation of the photoperiod is used to induce flower bud initiation, both the light intensity and the light source may effect the results obtained (3134, 3236).

How to get the best of both worlds:—A method of making tree seedlings flower early without dwarfing them (3370).

Pollination:—For pears a single day with good bee flying conditions is enough to ensure adequate pollination (3265). On the other hand, with apples quite small increases in the distance of trees from a pollen source may result in drastic reductions in yield (3263).

Fruit thinning:—Promising new chemicals (3278).

MACHINERY, BUILDINGS AND EQUIPMENT

Machines and tools:—Apart from a note on a planting machine adapted to handle soil blocks (3204d) and descriptions of three spraying machines (3183-3185) and of a silica gel insecticide applicator (3482), nearly all the machines and tools mentioned are concerned with harvesting crops. The crops include asparagus (3575), beans (3625), bulbs (3879, 3943j), nursery stock (3186, 3187), nuts (3369), prunes (3308b, 3308z) and tea (4116). For dealing with harvested crops there is a machine for cutting the stems of clusters of cherries (3308c), mechanical separators for cold-damaged oranges (3987) and mechanical methods of drying coffee (4059).

Buildings and equipment:—Greenhouses and their equipment are well sign-posted (3196-3202, 3203r, 3203s), but a dry scrubber designed to remove CO_2 from apple stores might be missed (3300).

METHODS, PRACTICAL AND EXPERIMENTAL

Bulk harvesting:—Further developments are reported for apples (3288-3292, 3309b), peaches (3295), and citrus (3985, 3986). A logical extension of the method is the export of apples in bulk containers (3293).

Other practical methods:—These include methods of measuring irrigation water (3188, 3204f), of providing artificial illumination (3193, 3194) and of determining the ripeness of a fruit (3285, 4011).

Sampling problems:—In relation to variability of foliar nutrient levels in apples (3168), fruit size in cherries (3167), maturity in grapes (3364) and both germination and sucrose content in sugar cane (4088, 4107).

Experimental techniques:—Methods are described for measuring or estimating leaf areas (3689), the number of cells in leaves (3174) the volume of attached tomato fruits (3690), the rate of photosynthesis (3169), atmospheric heat and water balances (3182), light intensity (3847) and rainfall and evapotranspiration (3203h, 3204c). Also described are a modified two-zone root system for nutrient uptake studies (3170), the use of a fluorescent dye for foliar penetration studies (3171), methods of labelling pollen and staining pollen tubes (3178, 3179), and also techniques for preparing whole mounts of embryo sacs (3203u), for macerating plant tissues (3173), for producing solutions that simulate drought conditions (3181) and for recording on paper the shapes of plant organs (3180). Finally, there is information on tissue cultures (3122, 3123), on autoradiographic methods (3176, 3177, 3203e, 3203g) and even on automation and cybernetics as applied to plants (3195).

Analytical methods:—For nutrient elements in leaves (3172, 3203c, 3203q, 3203v, 3308m), for the insecticides Phosdrin and dieldrin (3722y, 4058) and for the following organic compounds: chlorophylls (3204e), flavonoids (3791i), gibberellins (3204 l), oxalates (3723e) and phloridzin (3239).

NUTRITION

Humus:—Plants have been shown to benefit from applications of soil extract and of fulvic and humic acids (3132, 3133).

pH:—The results of a study in which orange seedlings were grown in solutions adjusted to pH 4 and pH 6 suggest that injury to roots growing at a low pH value is due to the toxic action of H ions rather than to indirect harmful effects of mild acidity (3961).

Plant composition:—There is another nutrient status survey, this time of orange groves in Florida (3956). Some of the problems encountered in interpreting the results of leaf and petiole analyses are once again stressed in investigations concerned with deciduous tree fruits (3257, 3259), strawberries (3334), vines (3354) and rubber trees (4077).

Major elements:—A high level of N supply appears to improve the flavour and texture of apples (3255), but perhaps only when fruit set is high (3253). Where soil has been fumigated, NO_3 is a much better source of N than NH_4 for tobacco (3742); on the other hand, NH_4 may make litchi trees more cold tolerant than NO_3 (4001). Other subjects dealt with include the effects of pH and temperature on the uptake of P and Ca by bean plants (3610), factors affecting the absorption of foliar-applied P, Ca and S (3125) and mineral losses from leaves by leaching (3126).

Minor elements:—Both lime-induced chlorosis and zinc deficiency are re-examined in relation to their effects on the metabolism of organic acids and proteins in plants (3130, 3960). In grape vines a temporary early-season deficiency of B may be influenced by pruning time (3380). In the nutrition of pineapples B and Ca are interrelated (4071).

Salinity problems:—The ill-effects on citrus of high Na in irrigation water may be counteracted by adding gypsum (3955). With brassica crops lack of Cl tends to increase the content of free amino acids in the plant tops (3583).

PHYSIOLOGY

Rhythms and surges:—Diurnal variations in the chlorophyll content of leaves (3135), photosynthetic surges in coffee seedlings (4045), seasonal variations in the amino acids of peach trees (3243) and alternating absorption and excretion of nutrients by roots (3127).

Water metabolism in plants:—Studied with the aid of heavy water (3143).

Growth substances in plants:—Apart from more or less inevitable further reports on gibberellin-like substances present in beans (3147, 3613), there are papers on abscission accelerators (3164, 3165), on the role of auxin in the sex expression of the cucumber (3599) and on a growth inhibitor responsible for incompatibility in cacao (4026).

Growth substances applied to plants:—The plethora of papers on gibberellins has reached the point at which we can only suggest that the reader either wades right through each number of *H.A.* or sit back patiently and awaits the arrival of the annual subject index. Other substances, about which new points of interest emerge, include 2,4-D (3491, 3492, 3570), IAA (3706) and MH (3156, 3157, 4101).

Other compounds which promote growth:—These include pectinase preparations (3161), but not, it would now seem, ascorbic acid (3585).

Gamma irradiation:—Readers who have acquired a stock of radioactive cobalt will doubtless be interested in 3121, 3646 and 3647.

PLANT PROTECTION

Viruses:—The causal agent of chlorotic streak of sugar cane can be transmitted not only by root contact but by stirring a nutrient solution in which both diseased and healthy plants are growing (4102). In a virus disease of camellias the symptoms can be removed temporarily by supplying iron (3924). Both infrared irradiation and the application of cadmium ions are reported to have reduced the incidence of virus diseases in plants (3605, 3779).

Bacteria, fungi and fungicides:—Disease organisms, such as *Armillaria mellea*, may conceivably have their good points (3386). Orchids when invaded by a fungus produce an antibody, orchinol, which shows strong fungistatic activity against the invader (3904, 3905). The resistance of apples to scab can be increased by applying certain amino acids (3415); if this fails, however, why not try encouraging earthworms to remove infected leaves (3244)? New chemicals include the antibiotics Tetrin and Vancomycin (3560, 3561) and a chloroaniline compound, Allisan, which is particularly effective against that universal scourge *Botrytis cinerea* (3671). Interest in the use of ammonia gas to control moulds of citrus fruits continues (3992-3994). Ammonia also turns up in the form of ammoniated Douglas fir bark, which, used as a soil amendment, markedly reduced the incidence of red-core disease of strawberries (3426). Finally, if all else fails to eradicate soil parasites, fumigants can be dispersed with the aid of explosives (3481).

Mites, insects and insecticides:—The discovery of a disease of citrus red mites, thought to be caused by a virus, suggests an interesting new approach to the problem of controlling spider mites (3980). New acaricides of promise include Chipman R-6199 and Phostex (3439, 3440), but perhaps the most revolutionary developments are the appearance of a silica gel powder which dries insects up and of hormones which cause them to commit suicide (3472). A new method of applying insecticides inside houses is to impregnate the air conditioning filters (3635). Damage to bees by insecticides may be reduced by the use of repellents or by proper timing (3476, 3626).

Birds:—Red-currant buds protected by spraying with water glass (3468).

Weeds:—Some weeds appear to produce extracts which may prevent crop seeds from germinating (3836). However, extracts of that well known curse, couch, twitch or quack grass, may depress the growth of some plants but stimulate that of others (3486, 3487).

Air pollution:—Ozonated hexene causing symptomless depression of growth in beans (3614) and plain ozone and SO_2 causing weather fleck in tobacco (3774, 3775, 3791e).

PROPAGATION

Seed viability and treatments:—When apple fruits are stored until the following summer the embryos in their seeds show two peaks of germination capacity (3219). With melons germination capacity varies with the region in which the seeds are produced (3601). Among treatments applied in the hope that they will hasten germination gibberellins are prominent (3152, 3308v, 3554, 3555). Other treatments reported to have this effect include soaking in alkaloids (3346) and notching raspberry seeds (3324).

Seedling production:—Of coffee and some ornamentals in polythene bags (3919, 4041) and of oil palms in half drums sunk in fermenting vegetable matter (4064).

Cuttings:—Another method of mist regulation is described (3190). More information is available on the effects of physiological age on the rooting capacity of cuttings (3875, 3930). Compounds that may stimulate rooting include penicillin (3162), an aloe extract (3941) and the fungicide methoxyethylmercuric chloride (3936).

Layering:—Wet sawdust may be much better than soil for earthing up stool beds of *Malus robusta* (3220).

Stock-scion relationships:—It seems that in some localities apples may yield much more in the early years when grown on their own roots than when grown on M.IX rootstocks (3222). Methods of detecting stock-scion incompatibility at an early stage are described for apricot varieties worked on peach seedlings (3228).

MISCELLANEOUS

Alcohol:—Lapped up by pea seedlings (3203i).

Art of illustration:—Strikingly revealed in three books (4126, 4132, 4134).

Economics:—Of small fruits and greenhouse roses (3311, 3330, 3912).

Rhythmophytes:—Those who don't know what this means are referred to 3858.

Tree stump destruction:—With a chemical concoction which aids burning (3488).

What's cooking?—Delicious ravioli and cromeskis prepared with protein extracted from nettles and rather mature river weeds (3842).

MISCELLANEOUS.

General.

3116. Sandison, A.
Some problems in naming varieties.
J. nat. Inst. agric. Bot., 1958, **8**: 253-6, bibl. 7.

The definitions of variety (cultivar) in the International Code of Nomenclature for Cultivated Plants and in the Report of the Committee on Transactions in Seeds are reviewed, and it is concluded that the term "strain" is unnecessary. There is need for fixity of nomenclature without discouraging efforts to improve cross-fertilized varieties during the re-selection necessary to maintain their characters. "Homonyms" (different varieties under the same name) and "synonyms" (different names for the same variety) create difficulties for growers and merchants. [Author's abstract.]

3117. Bate-Smith, E. C., and others.
Symposium on biochemistry and taxonomy.
Proc. Linn. Soc. Lond., 1958, **169**: 198-239, bibls.

The following 7 papers were presented at the symposium: Plant phenolics as taxonomic guides, by E. C. Bate-Smith; The occurrence of tannins and leuco-anthocyanins in dicotyledonous plants [abstract only], by C. R. Metcalfe; Alkaloids and plant taxonomy, by J. M. Rowson; Biochemistry as an aid to establishing the relationships of some families of dicotyledonous plants, by R. D. Gibbs; The distribution and biogenesis of the cucurbitacins in relation to the taxonomy of the Cucurbitaceae [see also *H.A.*, 28: 1545], by P. R. Enslin and S. Rehm; The taxonomic significance of primary and secondary metabolites [abstract only], by F. Hegnauer; The application of immunological methods to *Solanum* taxonomy [abstract only], by P. G. H. Gell, J. G. Hawkes and S. T. C. Wright.

3118. Hudson, J. P.
Weather, crops and man.
[*Publ.*] *Univ. Nottingham*, 1959, pp. 14, bibl. 8, 2s.

In this inaugural lecture the author discusses 3 main ways of increasing yield in relation to weather: (1) Breeding varieties that are more tolerant of adverse weather conditions or better suited to the conditions of a particular area. New rapid methods of assessing a variety's response to weather are mentioned. (2) Modification of the weather around the plant by cultural practices. On a field scale the only factor that can be altered in a major way is soil water status. (3) Altering the plant's response to weather by using chemical stimulants. The use of gibberellic acid to stimulate raspberry growth under marginal weather conditions [see *H.A.*, 29: 6] is cited as an example.

3119. Cole, H. M.
Financial results on eleven market garden holdings in Cornwall, Devon and Dorset. 5-year summary 1952/53 to 1956/57.
Rep. Univ. Bristol Dep. Econ. **110**, 1959, pp. 14, 2s. 6d.

Comparison is made of costs on holdings with glasshouses and those growing only outdoor crops. Keeping livestock was an economic proposition on intensive market gardens. It is considered questionable whether a grower can be financially successful on a holding of less than 5 acres without glass.

Seeds.

(*See also* 3203n, 3231, 3232, 3324, 3345, 3346, 3554, 3555, 3637, 3653, 3668, 3677, 3684, 3722t, 3723t, 3732, 3852, 3898, 3919, 3948, 4162t.)

3120. Landa, Z.
Benzene hexachloride as a polyploid-inducing agent. [Russian, with Czech summary 14 lines, and English summary 9 lines.]
Biol. Plant., Prague, 1959, **1**: 151-6, bibl. 10.

Polyploidy of *Linum usitatissimum*, *Viola tricolor maxima* and *Lactuca sativa* was induced when seeds were germinated on filter paper impregnated with a γ-BHC solution.—Inst. Plant Physiol., Prague.

3121. Preobraženskaja, E. I.
The comparative resistance to radiation of different species of cultivated plants. [Russian.]
Bot. Žurnal, 1959, **44**: 68-74, bibl. 5.

Seeds of 43 species from 15 families and 24 varieties of 3 species were treated with γ-rays from Co^{60}, and germination in the laboratory and also germination, growth and survival in the field were studied. Within certain families large differences in response to radiation were shown by species (Leguminosae, Labiatae), while in others the differences were small (Gramineae), and in some there were none (Cruciferae). Moreover, in some individual species (*Pisum sativum*, *Phaseolus vulgaris*) considerable variation in response occurred between varieties, while in others (*Triticum vulgare*) no great variation was found. There were differences also between reactions in the laboratory and in the field. It was shown that resistance was affected by the size of the seed within the family and species. large-seeded species of Leguminosae such as *Vicia faba*, *Pisum sativum* and *Phaseolus vulgaris* being sensitive, while small-seeded species of forage crops were resistant. Furthermore, large-seeded varieties of *P. sativum* and *V. faba* were more sensitive than smaller-seeded varieties. No direct relationship was found between resistance to radiation and the fat content of the cells.

Tissue culture.

(*See also* 3807, 3949.)

3122. Caplin, S. M.
Mineral oil overlay for conservation of plant tissue cultures.
Amer. J. Bot., 1959, **46**: 324-9, bibl. 22, illus.

Carrot and grape tissue cultures under a mineral oil (m.o.) overlay grew much more slowly and were brighter green and healthier than those in air. The depth of the overlay, up to 45 mm., had no effect on the growth rate. Growth under m.o. was much better than growth under nutrient solution, owing to the greater solubility of oxygen in m.o. Prolonged growth under m.o. did not affect the ability of cultures to grow subsequently on subculture in air. Because of the slower growth of cultures under m.o., each subculture period may be lengthened from about 4–6 weeks to as many months, with attendant savings in effort, time and materials.—Calif. Inst. Tech., Pasadena.

3123. Vasil, I. K.
Nucleic acids and survival of excised anthers *in vitro*.
Science, 1959, **129**: 1487-8, bibl. 15.

Excised anthers of *Allium cepa* and *Rhoeo discolor* have been successfully cultured in modified White's medium supplemented with various concentrations of ribonucleic acid and deoxyribonucleic acid. Ribonucleic acid proved to be much more useful than deoxyribonucleic acid and reduced the time required for the completion of meiosis from 48 hours to 24 hours. The role of nucleic acids in the control of nuclear divisions has been indicated. [Author's abstract.]—Univ. Delhi, India.

3124. Pierpoint, W. S.
Plant leaf mitochondria.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 92.

A medium containing sucrose, tris buffer, EDTA and citrate remains the most effective for preparing leaf mitochondria. Citrate in particular protects the oxidative properties of mitochondria of tobacco and lupin leaves. Mitochondrial activity *in vitro* seems to decrease with increasing age of the foliar source.

Nutrition and plant composition.

(*See also* 3203w, 3204k.)

3125. Barinov, G. V., and Ratner, E. I.
Some aspects of the uptake of nutrients by leaves from foliar sprays. [Russian, with English summary $\frac{1}{3}$ p.]
Fiziol. Rast., 1959, **6**: 324-32, bibl. 10, illus.

Labelled compounds of Ca, P and S were applied to leaves of tomato, cucumber, lettuce and primula to investigate the time lag (latent phase) between their application and their appearance in the tissues. Among the factors affecting the duration of this phase, in addition to the thickness of the cuticle, were the hygroscopicity and solubility of the salts applied and the selective properties of the protoplasm. In particular the translocation of P^{32} from the leaves was largely dependent on the physiological state of the plant and on external factors, the amount translocated being only a fraction of the total absorbed. Over 3 days only 10–20% of the P^{32} applied to the upper leaves of tomato was translocated. Diurnal temperature variations also affected the translocation, but not the uptake, of P^{32}.

3126. Bhan, K. C., Wallace, A., and Lunt, O. R.
Some mineral losses from leaves by leaching.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 289-93, bibl. 5.

Na^{22} was added to a nutrient solution in which cotton, Swiss chard and spinach plants were grown. Leaves were then subjected to leaching by simple immersion and also by shaking in distilled water for 24 hours. The loss of Na^{22} from Swiss chard averaged 3·1% for shaking compared with 1·9% for immersing. Immersed cotton leaves also showed little leaching of Na^{22}. Shaking resulted in the removal of Na^{22} to the extent of 52% in cotton and 28% in spinach, although these large losses may have been the result of mechanical injury. No cations or P were leached from mature sweet orange leaves either immersed or shaken mechanically in distilled water for 24 hours. Banana, *Musa cavendishii*, subjected to artificial rain for 24 hours, showed leaching losses of 8% of the original K and 14·6% of Mg; Abyssinian banana, *Ensete* sp., lost 4·5% of K and 6·1% of Mg. The latter losses were not statistically significant. The leaching losses observed in these studies were generally less than those reported by some workers. [From authors' summary.]—Univ. Calif., Los Angeles.

3127. Gunar, I. I., Krastina, E. E., and Petrov-Spiridonov, A. E.
Rhythm in the absorbing and excreting activity of roots. [Russian, with English summary 10 lines.]
Izv. Timiryazev. seljsk. Akad., 1959, No. 1, pp. 15-34, bibl. 35.

In continuation of earlier experiments [see *H.A.*, 28: 1031] using P^{32} and S^{35}, the activity of the roots of bean, tomato and other plants, even under constant conditions, showed a rhythm in which periods of excitation alternated with periods of inhibition. K and Ca were absorbed for a period and then eliminated. There was also a pulsation in the release of the sap exudate from the roots.

3128. Jackson, W. A., and Coleman, N. T.
Ion absorption by bean roots and organic acid changes brought about through CO_2 fixation.
Soil Sci., 1959, **87**: 311-19, bibl. 30.

Snap bean roots [excised] accumulated K more rapidly at high pH's or in the presence of HCO_3 than when the bathing solution was maintained below neutrality. Ammonium interfered seriously with K absorption from $KHCO_3$ and had a much more modest effect on absorption from KCl. Malate accumulation was associated with K absorption in the HCO_3 system, but not in the absence of HCO_3. This malate accumulation presumably resulted from CO_2 fixation *via* the phosphoenolpyruvate carboxylase-malic dehydrogenase pathway. The importance of CO_2 fixation by plant roots and the two metabolically different K absorption mechanisms in the soil environment are emphasized. [Authors' summary. See also *H.A.*, 28: 1058.]—N.C. St. Coll.

3129. Thomas, G. W.
Plant and soil factors influencing the mineral nutrition of plants.
Diss. Abstr., 1959, **19**: 2712, being *L.C. Card No. Mic.* 59-354 of 198 pp.

The experiments described were carried out, mainly in a greenhouse, on clover, sweet corn, beans and sweet potatoes. Lime applications to 5 North Carolina soils greatly increased the growth and divalent cation content of snap beans at all levels of applied potassium chloride. Potassium chloride applications were always followed by an increase in K and Cl contents, but did not affect growth unless lime was present. The growth and ion content of plants receiving the same nutrient treatment on different soils were greatly influenced by the type of exchanger present in the soils. The use of "ratio law" equilibrium measurements to predict ion contents of plants was investigated; a good linear correlation was found between the K content of plants and the function pK—$\frac{1}{2}$p Ca. Salt leaching from the root zone was small during the growing season.—N.C. St. Coll.

3130. Rhoads, W. A., Wallace, A., and Romney, E. M.
Lime-induced chlorosis studied.
Calif. Agric., 1959, **13**(3): 6, 15.

Malonic acid was shown to be a normal constituent of healthy bean leaves and to be present in fairly large amounts. In chlorotic plants the malonic acid content was variable, but there were accumulations of succinic, fumaric, isocitric, aspartic and glutamic acids. When green and chlorotic bean leaves were provided with radioactive CO_2 during photosynthesis, an unidentified organic component containing much radioactive C was found to be present in green plants, but essentially absent in chlorotic plants. Evidence is accumulating that organic acids and amino acids may be directly related to the causal mechanism of lime-induced chlorosis.

3131. Dietz, R.
Über den Einfluss von Aminosäuren auf die höhere Pflanze. (**The effect of amino acids on higher plants.**)
Bodenkultur, 1959, **10**: 144-7, bibl. 1.

Beans and oats benefited considerably from the application of certain amino acids, but they were injured by other products of protein decomposition.

3132. Sladký, Z., and Tichý, V.
Application of humus substances to overground organs of plants. [Czech and Russian summaries $\frac{1}{4}$ p. each.]
Biol. Plant., Prague, 1959, **1**: 9-15, bibl. 6, illus.

Foliar applications, twice weekly during June and July, of 2 ml. of a dialysed extract of garden soil (300 mg./l. of humus substances) per plant had a favourable effect on the growth of *Begonia semperflorens*. Marked increases were observed in lengths and in fresh and dry weights of stems and roots, in leaf chlorophyll contents and in rates of respiration. Growth was slowed down, leaves became wrinkled and lateral growth was stimulated when excess quantities of humus were applied.—Brno Univ.

3133. Sladký, Z.
The effect of extracted humus substances on growth of tomato plants. [Czech and Russian summaries 9–10 lines each.]
Biol. Plant., Prague, 1959, **1**: 142-50, bibl. 27, illus.

Fulvic acid had the most marked effect on tomato growth among the selected humus components tested. Plants treated with fulvic acid showed highly significant increases in stem height, fresh weight of stems and roots, and dry weight of stems; but increases in root length were not significant. With humic acid a similar but rather weaker effect was obtained, except that the increases in length of the roots was highly significant. An alcohol extract of garden soil significantly increased the length of stems and roots, and the fresh and dry weights of roots.—Brno Univ.

Physiology and metabolism.

(*See also* 3203f, i, j, m, 3204a, 3492, 3598, 3870, 3907, 3908, 4133, 4147.)

3134. Wellensiek, S. J.
Photoperiodical reactions of *Perilla crispa*.
Reprinted from *Proc. kon. ned. Akad. Wetensch. Ser. C*, 1958, **61**: 552-60, bibl. 8, illus.

In a series of 5 experiments under glass it was found that the photoperiodical reactions of this short-day plant were checked, but not subsequently disturbed, by exposure to 5° C. At normal temperatures continuous light prevented flower induction for its duration and had a retarding effect afterwards. It is suggested that light above a certain minimum intensity results in the formation of an induction inhibitor in short-day plants, which is destroyed during darkness.

3135. Bavrina, T. V.
Diurnal variations in the chlorophyll content of leaves. [Russian.]
Fiziol. Rast., 1959, **6**: 213-16, bibl. 16.

In perilla and rudbeckia grown under both short- and long-day conditions the chlorophyll content of the leaves showed 1 or 2 maxima during the daytime. During the night the chlorophyll content varied in the plants receiving short-day treatment but not in those receiving long-day treatment.

3136. Rubin, B. A., and Germanova, V. F.
Pigment synthesis in roots. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1959, **124**: 940-3, bibl. 7.

Further data, from broad beans, nasturtiums, peas and other plants, are presented confirming the results of earlier work [see *H.A.*, 27: 2028], which suggested that reactions proceeding in the root system play an essential role in determining the biosynthesis of photosynthetic pigments and enzymes in the plant. They also show that specific variations in the influence exerted by the roots on such synthesis in the leaves are positively correlated with differences in the ability of the roots to carry out this synthesis when illuminated.

3137. Moyse, A.
Some aspects of photosynthesis in connection with the metabolism of organic and amino acids. [Russian, with French summary ½ p.]
Fiziol. Rast., 1959, **6**: 274-85, bibl. 30, illus.

Studies on leaves of *Bryophyllum daigremontianum*, grown in gravel culture and then placed in an atmosphere containing $C^{14}O_2$, showed that the ability of these leaves to fix CO_2 in the dark is due to the β-carboxylation of phosphoenolpyruvic acid. A primary product of this reaction, which is bound up with respiration, is malic acid, and citric and isocitric acids occur as secondary products. Nitrates reduced the fixation of CO_2 through competition between the NO_3 and CO_2. At low light intensities the synthesis of amino acids increased relative to that of sugars, and at higher intensities the oxidation of organic acids was accelerated. The carbon fixed, during darkness, in organic acids was slowly redistributed during light and used in photosynthesis. This fact indicates that pentoses and their carboxylation play a fundamental part in the various modes of CO_2 fixation, and that there is a close connection between photosynthesis and other processes of plant metabolism.—Lab. Photosynthèse, Centre nat. Rech. sci.

3138. Pleškov, B. P., Šmyreva, T. V., and Ivanko, Š.
The rate of amino acid metabolism in plants. [Russian, with English summary 7 lines.]
Biohimija, 1959, **24**: 408-13, bibl. 21, illus.

When mineral nitrogen was introduced into bean leaves by vacuum infiltration the first amino acids to accumulate were glutamic, aspartic and aminobutyric acids, together with glutamine. After 4 hours the total free-amino acid content of the leaves increased by 50–100%.

3139. Kretovič, V. L., and Jakovleva, V. I.
The biosynthesis of glutamic acid and glutamine in pea and wheat seedlings. [Russian, with English summary ½ p.]
Fiziol. Rast., 1959, **6**: 165-70, bibl. 14, illus.

Potassium α-ketoglutarate introduced into the seedlings caused an initial fall in the glutamine content through transamination, whereas the introduction of ammonium α-ketoglutarate induced synthesis of glutamic acid and especially of glutamine. It is considered that in living plant tissue glutamine is the main product of ammonia fixation and an important source of amino-groups for the transamination of keto-acids.

3140. Racusen, D., and Hobson, E. L.
Concerning the site of protein synthesis in leaves.
Arch. Biochem. Biophys., 1959, **82**: 234-6, bibl. 6.

Young Swiss chard leaves were exposed in the light to $C^{14}O_2$ for various periods from 15 to 120 minutes. Following exposure samples were fractionated to separate intact chloroplasts from cytoplasm (i.e. the resulting supernatant extract). The specific activities of the protein-bound amino acids were then measured in both chloroplasts and cytoplasm. The results failed to show any significant differences between the synthesis of the chloroplast and cytoplasmic proteins even in the samples that had been exposed for only 15 minutes.—Shell Develop. Co., Modesto, Calif.

3141. Koloušek, J., and Jiráček, V.
Vliv D,L-methionin-sulfoximinu na proteosyntézu hrachu. (**The effect of D,L-methionine-sulphoximines on protein synthesis of peas.**) [Russian and German summaries ¼ p. each.]
Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1958, **31**: 1593-8, bibl. 15, illus.

Root and leaf growth of germinating pea seeds was markedly inhibited by methionine-sulphoximines at 10^{-6} M. Paper chromatographic studies showed that this effect resulted from a disturbance in the protein metabolism of the seed.

3142. Kausch, W., and Ehrig, H.
Beziehungen zwischen Transpiration und Wurzelwerk. **(The relationship between transpiration and root system.)**
Planta, 1959, **53**: 434-48, bibl. 10, illus.

Changes in the top/root ratio (made by cutting away leaves or roots) of plants grown in nutrient solution resulted in marked changes in the rate of transpiration. Pruning of the roots caused a decrease, and cutting of the leaves an increase, in the rate of transpiration per unit of leaf area. An increase in the rate of evaporation caused the root system to enlarge and the ratio top weight/root weight to become smaller. The test plant was *Coleus shirensis*.—Bot. Inst. tech. Hochsch. Darmstadt.

3143. Vartapetjan, B. B., and Kursanov, A. L.
A study of the water metabolism in plants with the aid of heavy water, H_2O^{18}. [Russian, with English summary $\frac{1}{3}$ p.]
Fiziol. Rast., 1959, **6**: 144-50, bibl. 11.

When 7–15-day-old bean plants were placed in a nutrient solution containing H_2O^{18}, equilibrium was attained when the concentration of O^{18} in the water of the plant tissues was 60% of that in the nutrient solution. Equilibrium set in much more rapidly in the roots than in the stems or leaves, and the final H_2O^{18} content was highest in the stems. The water in the tissues of plants grown from seed in the solution containing H_2O^{18} showed a concentration of O^{18} little different from that of the solution. It is suggested that the difference is due to the presence in plants of water which is not readily exchangeable, especially in those organs in which metabolism is most intense.

3144. Sergeev, L. I., Sergeeva, K. A., and Mel'nikov, V. K.
The isoelectric point of protoplasm in relation to the physiological condition of generative buds in woody plants. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1959, **125**: 1162-5, bibl. 17.

In flower buds of apples and cherries higher physiological activity (as measured by moisture content, water retaining capacity, respiration and absorption of P^{32}) was associated with a reduction in the pH of the isoelectric point of the protoplasm.

Growth substances.

(*See also* 3203z, 3204 l, 3240-3242, 3267, 3359-3361, Weeds and weed control section, 3554-3556, 3570, 3584, 3595, 3613, 3630, 3638, 3653, 3668, 3706, 3707, 3755, 3767, 3768, 3848, 3849, 3856, 3876, 3878, 3914, 4072, 4100, 4101, 4146.)

3145. Wheeler, A. W.
Biological assay of leaf growth-substances.
A.R. Rothamsted exp. Stat., 1958, 1959, pp. 77-8.

Discs were cut from etiolated primary leaves of dwarf bean seedlings and floated on test solutions of growth substances containing 1% sucrose. Measurements taken after 24 hours in darkness at 25° C. showed that both kinetin (Ki) and gibberellic acid (GA) accelerated leaf expansion. At concentrations of 10^{-5} M or 10^{-6} M their effects were less than that of fluorescent light of 400 f.c. intensity. Light eliminated the effect of Ki, but slightly enhanced that of GA. In discs floating with the "upper" (adaxial) surface in contact with the solution, the response to light + GA was smaller than in those in the reverse position. GA was less effective when sucrose was omitted. The veins, but not the interveinal tissues, were stimulated by IAA at 10^{-5} M or 10^{-6} M, and lengthened at an increased rate. Sensitivity of leaves to GA was greatest in seedlings grown from small seeds, but seed size had no effect on response to Ki. Ascorbic acid inhibited leaf expansion at 10^{-3} M and had no effect at 10^{-4} M. Carbanilide slightly increased leaf expansion, its maximal effect being at 10^{-3} M. [For earlier work see *H.A.*, 28: 2109.]

3146. Humphries, E. C., and Wheeler, A. W.
Mode of action of kinetin and gibberellic acid on leaf expansion.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 79.

Kinetin appeared to increase in darkness, but to decrease in light, the final number of cells in discs from etiolated primary leaves of dwarf bean. Its effect was smaller than that of 400 f.c. fluorescent light. Gibberellic acid increased cell size, but not cell division. [See also *H.A.*, 28: 2109.]

3147. West, C. A., and Phinney, B. O.
Gibberellins from flowering plants. I. Isolation and properties of a gibberellin from *Phaseolus vulgaris* L.
J. Amer. chem. Soc., 1959, **81**: 2424-7, bibl. 21.

A procedure is described for the isolation of a gibberellin, bean factor II, from acetone-water extracts of immature bean seed (*Phaseolus vulgaris* L.). Bean factor II can be distinguished from the fungal gibberellins, gibberellic acid, gibberellin A_1 and gibberellin A_2, on the basis of its differential biological activity for dwarf maize mutants *dwarf*-1 and *dwarf*-5, its chromatographic behavior and its infrared spectrum. Preliminary chemical studies suggest that bean factor II has a carboxylic acid and a lactone functional group, as well as sites of unsaturation not in conjugation with either of these. [Authors' abstract.]—Univ. Calif., Los Angeles.

3148. Thorup, S.
Resultater af forsøg med gibberellin. **(Results obtained in experiments with gibberellin.)** [English summary $\frac{1}{2}$ p.]
Horticultura, 1959, **13**: 27-31, 47-50, 97-107, illus.

(1) *Effects on growth and development.* Treatment of young plants with gibberellic acid stimulated cell elongation in stems, shoots and petioles, and increased the fresh weight. In a coleus variety spraying with 25–100 p.p.m. GA produced the maximum number of lateral shoots of the first order. In *Coprosoma* sp., drop treatment of lateral shoots resulted in compact growth. Graphs show the degree of bending induced in the stems of tradescantia, *Zebrina pendula* and *Setcreasea striata* cuttings following the application of different dosages of GA. Data on the influence of GA upon the top-root ratio of *Tradescantia*, *Zebrina* and *Commelina* spp. and upon the development of aerial roots in these and other ornamental plants are tabulated. (2) *Effects on flowering and fruit set.* Treatment advanced flowering in *Cleome monophylla*, *Tagetes patula* and *Pelargonium zonale* and it favoured fruit set in *Ricinus communis*. In an aqueous solution the potassium salt of GA lost about one-half of its effect on standing for 6 weeks. (3) *Effects on dormancy.* Immersion in 1,000 p.p.m. GA for 24 hours hastened the germination of immature barley seed. Bulbs and tubers, notably tulips, were also successfully treated by immersion in a similar solution. In certain trees and shrubs bud burst was greatly advanced by GA. Treatment of single beech buds showed that GA is translocated upwards more quickly than downwards.

3149. Sachs, R. M., Bretz, C. F., and Lang, A.
Shoot histogenesis: the early effects of gibberellin upon stem elongation in two rosette plants.
Amer. J. Bot., 1959, **46**: 376-84, bibl. 32, illus.

Within 24 hr. after the application of gibberellic acid (GA) to vegetative plants of biennial *Hyoscyamus* and of the long-day plant *Samolus*, a considerable increase in mitotic activity was observed in the pith, cortical and vascular tissues of the rosette axis immediately below the apical meristem. As the treatment continued, the zone of cell division increased, commensurate with the increase in length of the stem; the new cell divisions formed transverse walls predominantly and thus contributed to stem elongation. The cell contribution from the apical meristem was but a small fraction of the total produced by the subapical tissues, suggesting that the induced subapical mitotic activity is the main site of tissue development in the shoot. There was no evidence for cell elongation for at least 72 hr. after application of GA, and, hence, the initial increase in stem length was due solely to an increase in cell number. [From authors' abstract. See also *H.A.*, 27: 3051 and 28: 2146s.]—Univ. Calif., Los Angeles.

3150. Lebedenko, L. A.
The effect of gibberellin on the activity of the apical meristem in certain plants. [Russian.]
Bot. Žurnal, 1959, **44**: 215-19, bibl. 18, illus.

The apical meristems of *Nicotiana tabacum* var. Mamont, *N. silvestris* and *Perilla nankinensis* showed marked reactions to gibberellin, though the response differed with the plant. Increased mitotic activity occurred in all 3 species, indicating that gibberellin is a stimulant of cell division. In perilla the increased mitotic activity was accompanied by a disruption of the structure of the apex; similar but lesser changes occurred in *N. silvestris* but not in *N. tabacum*.

3151. Krekule, J., and Ullmann, J.
The influence of gibberellic acid on the growth of overground parts and roots of wheat, lettuce, and oats. [Czech and Russian summaries $\frac{1}{3}$ p. each.]
Biol. Plant., Prague, 1959, **1**: 22-30, bibl. 10.

Lettuce seedlings growing in a nutrient solution with 10 μg. GA/ml. showed significantly stimulated growth of aerial parts and inhibition of root growth. Fresh weight was markedly increased, with a smaller increase in dry weight.—Inst. Biol., Prague.

3152. Kallio, P., and Piiroinen, P.
Effect of gibberellin on the termination of dormancy in some seeds.
Nature, 1959, **183**: 1830-1, bibl. 6.

Seeds of about 50 species were collected in the autumn near the Arctic Biological Station and were treated with GA solutions at strengths between 0·001 and 0·5%. Some 8 species responded by markedly increased germination compared with the controls. Some species needed prolonged treatment, and in the case of *Geranium silvaticum* the best results followed pretreatment with sulphuric acid.—Univ. Turku, Finland.

3153. Clor, M. A., Currier, H. B., and Stocking, C. R.
Growth responses resulting from gibberellic acid and 2,4-D interaction.
Bot. Gaz., 1958, **120**: 80-7, bibl. 17, illus.

Kidney beans and cotton seedlings were used as test plants. Curvature of the bean epicotyl, induced by applying 1 μg. or 5 μg. of 2,4-D to a primary leaf, was enhanced if the same leaf had received 10 μg. of GA $\frac{1}{2}$ hr. previously, but application of the 2 substances to opposite members of the pair of primary leaves produced no significant evidence of synergistic action. The shoot elongation induced by the GA treatment was inhibited by 2,4-D to an extent proportional to the latter's concentration, and the effect was greatest when the 2 substances were applied simultaneously, resulting in deformity of the terminal bud at 5 μg. or more per plant. When 2,4-D was applied 2 days before GA, the terminal bud began to proliferate. In most instances a secondary shoot developed below the deformed bud, showing decreasing symptoms of 2,4-D injury, but persistence of the GA stimulus for at least 3 weeks. Synergistic action on petiole and leaf-blade growth was evident where the response of GA-treated primary leaves was enhanced by simultaneous or subsequent low-dose 2,4-D treatment of the opposite leaf. However, when 2,4-D at 5 µg. or more was applied to one primary leaf, its size increased less when its partner was treated 2 days later with GA than when the partner was untreated.

3154. Basler, E.
The effects of gibberellic acid on the translocation, metabolism and toxicity of 2,4-D in bean plants.
Proc. 12th south. Weed Conf., 1959, p. 171.

Bean plants were treated with 100 *u*g. GA and 50 µg. 2,4-D together (1) on the same, or separately (2) on opposite, primary leaves. Treatment (1) resulted in at least as much growth inhibition as from 2,4-D alone and more than from (2); (1) and (2) resulted in greater translocation of 2,4-D, but (1) increased it sooner than (2). GA did not alter the rate of breakdown from either type of treatment. Treatment (1) stimulated respiration less than (2) or than 2,4-D alone.—Okla agric. Exp. Stat., Stillwater.—*Weed Abstr.*, **8**, No. 1363.

3155. Campbell, R. W.
Some effects of various esters of 2,4-dichlorophenoxyacetic acid on the morphological development of the strawberry.
Weeds, N. York, 1959, **7**: 77-81, bibl. 10.

The methyl, ethyl, butyl, butoxy ethanol and propylene glycol butyl ether esters of 2,4-D were sprayed onto strawberry plants at 1 and 4 mg./plant. The lower rate had a negligible effect on shoot or root weight; the higher rate reduced both and had a greater effect on shoot than root weight. The activity of the esters decreased as the molecular weight increased. This decrease was more apparent with reference to the root than the shoot. The abnormalities caused are mentioned.—Kansas agric. Exp. Stat., Manhattan.—*Weed Abstr.*, **8**, No. 989.

3156. Baker, J. E.
An investigation of the mechanism of action of maleic hydrazide in tobacco and other plants.
Diss. Abstr., 1959, **19**: 2726, being *L.C. Card No. Mic.* 59-339 of 110 pp.

An inhibition of respiration of seedlings and axillary bud tissue of tobacco was produced by high concentrations (0·009 to 0·27 M) of MH, and the effect was enhanced by lowering the pH of the medium to 4. There was no evidence that MH inhibited the activity of any of the dehydrogenases studied. The enzyme diophorase, which can catalyze the reduction of cytochrome *c* in the presence of reduced pyridine nucleotides and quinones, was inhibited by MH concentrations which also inhibited respiration of certain plant tissues. Other non-respiratory enzymes studied were nucleosidase, glutamyl transferase and DPNase; these were not affected by high concentrations of MH. Energy-storing mechanisms of oxidative and photosynthetic phosphorylation of plants were not affected by high concentrations (0·01 M) of MH. At this same level MH did not appear to inhibit the incorporation of C^{14}-glutamate into the proteins of pea and tobacco root particles, whether nucleosides were present or not. MH as the diethanolamine salt was bound to proteins and RNA *in vitro*; binding was less from the K salt of MH. Studies with labelled MH showed that some of the diethanolamine salt remained unbound in the plant.—N.C. St. Coll.

3157. Smith, A. E., and others.
Factors affecting the performance of maleic hydrazide.
J. agric. Food Chem., 1959, **7**: 341-4, bibl. 10.

The plant growth inhibitor maleic hydrazide must be absorbed and translocated to be effective. Studies using tracer, spectrophotometric and chromatographic techniques showed that maleic hydrazide is stable and nonvolatile, and is efficiently translocated. Absorption is often slow. Experimental techniques made it possible to get quantitative data on variables influencing absorption rate. Light, temperature and application rate were not critical within the usual range. Plant species and plant condition had significant effects. Relative humidity and formulation were more important. Maleic hydrazide was absorbed poorly from all formulations at low relative humidity. At moderate and high humidities formulation differences were evident. The diethanolamine salt was the most practical of the types absorbed efficiently. [From authors' abstract.]—Naugatuck chem. Div. U.S. Rubber Co., Naugatuck, Conn.

3158. van de Westeringh, C., and Veldstra, H.
Researches on plant growth regulators, XXIII. Structure/activity, VIII. Phosphonic and phosphonous acids.
Reprinted from *Rec. Trav. chim. Pays-Bas*, 1958, **77**: 1096-1106, bibl. 25, illus.

Phosphonic and phosphonous acids of the indole and the naphthalene series were synthesized and assayed in the pea test and the avena straight growth test. 3-Indolylmethylphosphonic acid proved to be the most active compound among the phosphonic acids, the activity of which was generally surpassed by that of the corresponding phosphonous acids. Compared herewith, substituted phenoxy-methylphosphonic acids and also arsonic acids of the naphthalene series were practically inactive. [Authors' summary.]—Res. Lab., Nedchem (Quinine Works), Amsterdam.

3159. van de Westeringh, C., and Veldstra, H.
Researches on plant growth regulators, XXIV. Structure/activity, IX. Tetrazole derivatives
Reprinted from *Rec. Trav. chim. Pays-Bas.* 1958, **77**: 1107-13, bibl. 7, illus.

Tetrazole analogues of different types of carboxylic acids active as growth substances were synthesized and analysed as to their activity in the pea test and in the avena straight growth test. A large difference between the activities of indole and naphthalene derivatives, not normally found with growth substances, was observed. [Authors' summary.]—Res. Lab., Nedchem (Quinine Works), Amsterdam.

3160. van de Westeringh, C., and Veldstra, H.
Researches on plant growth regulators, XXV. Structure/activity, X. On the influence of the polar group on growth substance transport. Comparative investigations with ^{14}C-labeled indolylacetic acid and indolylmethanesulphonic acid.
Reprinted from *Rec. Trav. chim. Pays-Bas.* 1958, **77**: 1114-28, bibl. 20, illus.

By comparative investigations with 3-indolylacetic acid and its sulphonic acid analogue, both labeled with ^{14}C in the CH_2-group of the side chain, it was shown that the uptake of the partly dissociated carboxylic acid [by portions of pea stem] is much higher than that of the completely dissociated sulphonic acid. This explains the high external concentrations required for the latter to show physiological activity. As the synergist di-*n*-amylacetic acid does not influence the uptake of the growth substances, its action must be concerned with a redistribution of the active compounds inside the cell. [Authors' summary.]—Res. Lab., Nedchem (Quinine Works), Amsterdam.

3161. Wheeler, A. W.
Growth promotion by pectinase preparations.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 79.

A pectinase preparation in dilute solution was effective in promoting extension growth of wheat coleoptile and pea epicotyl sections. It was more effective with EDTA at 10^{-3} or 10^{-4} M. A similar mixture of pectinase and EDTA had only a slight, but significant, effect on expansion of leaf disks. Current theories of the structure of the cell-wall and cell expansion suggest that the growth-promoting effect of pectinase may be attributable to increased plasticity of the cell-wall brought about by breakdown of pectin. [Author's report.]

3162. Popov, M. D.
L'influence de la pénicilline sur la formation des racines de boutures de certaines plantes. **(The effect of penicillin on root formation in cuttings of certain plants.)** [Russian summary ½ p.]
C.R. Acad. bulg. Sci., 1959, **12**: 65-8, bibl. 11, illus.

With Rila tobacco, dipping the cuttings in a solution of penicillin (100,000 international units/litre) for 1 hour resulted in the best rooting after 14 days. A concentration of 75,000 i.u./l. stimulated the best root growth with Harmanly No. 163 tobacco and with *Nicotiana rustica* Napa No. 7. With *Parthenocissus quinquefolia* the effect of a penicillin dip was in general fairly slight. *Campsis radicans* responded strongly to penicillin treatment, the effect being most marked at a concentration of 25,000 i.u./l.

3163. Libbert, E.
Wechselwirkungen zwischen verschiedenen synthetischen Auxinen bei Keimungsversuchen. **(The interaction between different synthetic auxins in germination experiments.)** [English summary 13 lines.]
Biol. Zbl., 1959, **78**: 502-18, bibl. 6.

The effects on seed germination (*Lepidium sativum*) of 7 auxins and of indole and tryptophan were investigated. The auxins were: indole-3-acetic acid (IES), indole-3-n-butyric acid (IBS), 2,4-dichlorophenoxyacetic acid (2,4-D), potassium naphthalene-1-acetate (NES), phenylacetic acid (PES), phenyl-n-butyric acid (PBS), and naphthoxy-2-acetic acid (NoES). The substances were tested separately and in combination. Statistical methods were applied to detect possible interactions of single substances and to determine whether some of the substances may have the same primary action in relation to the inhibition of germination. The substances were found to belong to five groups. Members of one group may have a common primary action; members of different groups produce different primary actions. The five groups are: (1) IES, IBS, 2,4-D; (2) NES, NoES; (3) PES, PBS; (4) tryptophan; (5) indole. At low concentrations IES caused significantly greater inhibition than any other substance examined. [From author's summary.]—Humboldt Univ., Berlin.

3164. Van Steveninck, R. F. M.
Abscission-accelerators in lupins (*Lupinus luteus* L.).
Nature, 1959, **183**: 1246-8, bibl. 10.

Two substances were obtained from rapidly growing pods collected 7 days after flowering. These were a growth promoter (A) and a powerful inhibitor (B) which caused up to 90% inhibition of wheat coleoptile extension. Both accelerated leaf abscission with proximal application to explants, but with distal application the inhibitor B accelerated abscission and A delayed it.—D.S.I.R., Christchurch, N.Z.

3165. Osborne, D. J.
Identity of the abscission-accelerating substance in senescent leaves.
Nature, 1959, **183**: 1593, bibl. 3.

Referring to the previously abstracted paper the author adds the following information: "Using bean explants for the bioassay, and testing a wide range of concentrations, no abscission-accelerating activity has been found for glucose, fructose, sucrose, glycine, aspartic and glutamic acids, L-valine, L-histidine, L-leucine, L-tyrosine, cysteine, methionine, adenine, guanine, xanthine, hypoxanthine or uracil." [See also *H.A.*, 26: 1336.]—A.R.C. Unit exp. Agron., Oxford.

Statistical design and sampling.

(*See also* 3203k, 3376s.)

3166. JUNGES, W.
"Barrieren-Effekte" und ihre biostatistische Auswirkung in entwicklungsphysiologisch-ökologischen Versuchen mit gärtnerischen Kulturpflanzen. (**"Barrier effects" and their biostatic action in developmental-ecological experiments with horticultural plants.**)
Gartenbauwiss., 1958, **23**: 408-18, bibl. 11.

The word "barrier effects" is used to denote an inhibition in the development of plants caused by the unintentional effect of environmental factors occurring in developmental-ecological experiments. If only some of the variables are affected by the inhibition the author speaks of "interstitial" barriers, but if all variables are affected the barriers are called "frontal". Barrier effects result primarily in an increase or a decrease in the magnitude of the differences between experimental variables and are therefore liable to lead to false conclusions. Reference is made to two practical examples concerned with the vernalization of lettuce seed and the photoperiodic treatment of *Matthiola incana*. The statistical implications of barrier effects in the design and evaluation of trials are discussed.—Inst. Gartenb. Dresden-Pillnitz.

3167. DAVIDSON, T. R., AND GEORGE, J. A.
Variation in weight, volume and diameter of sour cherry fruits from individual trees.
Canad. J. Plant Sci., 1959, **39**: 210-14, bibl. 4.

A sampling procedure is proposed for estimating variations in the size of sour cherry fruits taken from various parts of a tree. Fruit weight and volume were both found to be highly correlated with diameter, and either value may be used to estimate fruit size. A sample should consist of 200 cherries, as this number gives a near normal distribution curve. Analyses of variance showed that weight, volume and diameter values varied significantly according to the level (top, centre or bottom) within the crown from which the samples were taken. The quarter of the tree (N, S, E or W) sampled may or may not have a significant effect. For estimating differences in fruit size between trees, 4 samples should be taken from each tree, one from each quarter at the centre level. This technique was developed for use in determining the effects of cherry yellows and necrotic ring spot on yield and size of fruit.—Canada Dep. Agric., Ottawa, Ont.

3168. LEEFE, J. S., AND EAVES, C. A.
The variability of foliar nutrient levels and storage behavior of apples from commercial orchards.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 52-6, bibl. 12.

The variability of leaf nutrient levels and apple storage characters was examined in 9 McIntosh apple orchards over a 2-year period. Large differences were found in the coefficients of variation of the factors under study. A table is presented for calculating the likely number of trees per replicate required to obtain a predetermined degree of precision with the different factors. [Authors' summary.]—Canada Dep. Agric., Kentville, N.S.

Experimental techniques.

(*See also* 3203c, e, g, q, u, v, 3204e, h, 3308m, 3376e, 3484n, 3485a, h, l, 3723e, 3791i, m, 3845q, 3847, 4162b.)

3169. VOZNESENSKIJ, V. L., SEMIHATOVA, O. A., AND SAAKOV, V. S.
Experimental verification of the radiometric method of evaluation of the rate of photosynthesis. [Russian, with English summary 4 lines.]
Fiziol. Rast., 1959, **6**: 380-4, bibl. 7.

By introducing $C^{14}O_2$ into a nutrient medium and measuring the relative activity of preparations made from the plants grown in it, the absolute amount of C or CO_2 absorbed by the plant can be determined, as well as the quantitative distribution and redistribution of the absorbed C in the plant of in various organic compounds. [From author's English summary.] The experimental plants were cineraria, broad bean and *Ficus benjamina*.

3170. NORMAN, A. G., JACKSON, W. A., AND SHAPPIRIO, E. B.
A two-zone root system for nutrient uptake studies.
Soil Sci. Soc. Amer. Proc., 1959, **23**: 251, bibl. 1.

A modification of the method of Stanford and DeMent [*Soil Sci. Soc. Amer. Proc.*, 1957, **21**: 612-17] is described. Seedlings are grown in a shallow layer of nutrient-enriched vermiculite supported on Saran [plastic] cloth, 12 mesh or larger, suspended over a second vessel containing water. Roots which penetrate into the water are used for uptake or inhibitor studies. The technique, which has obvious advantages over the use of excised roots, can be used for various purposes. Basically, however, it provides for uptake studies standard roots that have not themselves been fully exposed to the nutrient environment supporting the growth of the seedling.—Univ. Michigan, Ann Arbor.

3171. Dybing, C. D., and Currier, H. B.
A fluorescent dye method for foliar penetration studies.
Weeds, N. York, 1959, **7**: 214-22, bibl. 24, illus.

A technique is described for the use of a fluorescent dye (3-hydroxy-5,8,10-pyrenetrisulphonate) in foliar penetration studies, which is simple and rapid, requires no expensive equipment, and establishes the location of the penetrant on the cellular level. The dye is limited to the walls of normal uninjured cells, and it is thought that it will be of use primarily to follow stomatal penetration, in screening surface-active agents and as a criterion of vitality in studies dealing with penetration.—Univ. Calif., Davis.—*Weed Abstr.*, **8**, No. 1366.

3172. Steyn, W. J. A.
Leaf analysis. Errors involved in the preparative phase.
J. agric. Food Chem., 1959, **7**: 344-8, bibl. 22.

Washing, drying, grinding and storage processes are subject to errors which may add up to as much as 10% in the final results of chemical analysis. These processes are critically examined and a precise procedure is recommended for the preparation of samples of citrus and pineapple leaves.—Rhodes Univ., Grahamstown.

3173. Letham, D. S.
Maceration of plant-tissues with ethylene-diamine-tetra-acetic acid.
Fruit World, Melbourne, 1959, **60**(2): 46-7, bibl. 3.

The chelating agent dissolves the insoluble salts of pectic and low-methoxyl pectinic acids in the middle lamellae. It macerates effectively at pH 7 to 10 and at 37° to 45° C., without causing damage to the cells or changes in cell volume. The technique used in macerating apple fruit and carrot tissue is described.—D.S.I.R., Auckland, N.Z.

3174. Humphries, E. C.
A method of estimating the number of cells in leaves.
A.R. Rothamsted exp. Stat. 1958, 1959, pp. 78-9.

Leaves or discs from leaves, were incubated with pectinase preparations in the presence of the disodium salt of ethylene-diamine-tetra-acetic acid (EDTA). This method gave good cell separation with dwarf bean and tobacco, but with holly and ivy the epidermis, upper or lower, remained as a sheet of tissue, and leaves of grass and barley remained intact. Primary leaves of dwarf beans grown in darkness had approximately half the number of cells found in those grown in the light.

3175. Lamort, C.
Chromatography, absorption spectra and degradation of fruit anthocyanins. [French?]
Rev. Ferment., 1958, **13**: 153-7, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-278.

Pigments were separated from a variety of fruits by the descending paper chromatographic technique using butanol, acetic acid, water (4 : 1 : 2·5) as the developing solvent. Each pigment was eluted with a buffered citrate solution (pH 2·00) and characterized spectrophotometrically. Degradation studies were made by boiling each pigment for a known time in a water bath. The rate of degradation was found to increase in passing from the orange to the violet colours. Strawberry pigments were the most resistant to heat.

3176. Inselberg, E.
Simplified procedures for radioassay and autoradiography of plant materials.
Agron. J., 1959, **51**: 301-6, bibl. 8, illus.

A jacketed counter for the radioassay of liquids was compared with a conventional end window Geiger tube, using P^{32} and K^{42}, and was found to have a higher degree of precision. Measurements were 57·3% (P^{32}) and 22·4% (K^{42}) as variable as with the end window tube, and a given counting rate was obtained with 9·92% (P^{32}) and 4·21% (K^{42}) only of the activity required by the tube. The response of the jacketed counter was linear up to approximately 10,000 counts/min. The jacketed counter reduced expense and hazard, and eliminated the need for pipetting and evaporating samples. The technique was also simplified by the use of individually packed film. Autoradiograms of various species including tobacco and tomato are shown and discussed.

3177. Yamaguchi, S., and Crafts, A. S.
Autoradiographic method for studying absorption and translocation of herbicides using C^{14}-labeled compounds.
Hilgardia, 1958, **28**: 161-91, bibl. 17, illus.

Detailed instructions are given for obtaining autoradiographs of plants, ranging from grasses to trees, containing labelled compounds. The various processes are clearly illustrated.

3178. Fomin, A. E., and Astakova, N. K.
Methods of labelling pollen in plants. [Russian.]
Selekcija i Semenovodstvo, 1957, No. 3, pp. 72-3, from *Ref. Ž.* (*Biol.*), 1958, No. 8, Abstr. 34,216.

P^{32} and S^{35} accumulated in all organs including pollen and seed when applied to the foliage of hemp, into the bark of fruit trees or to the roots of both. When single branches were treated, the radioactive substances accumulated predominantly in that branch. Labelled sulphur accumulated in greater quantities when applied as methionine than as mineral sulphur.

3179. Martin, F. W.
Staining and observing pollen tubes in the style by means of fluorescence.
Stain Tech., 1959, **34**: 125-8, bibl. 5, illus.

Pollen tubes in the styles of the tomato and of other flowering plants can be observed by using the following technique. Styles are fixed in formalin-acetic-80% alcohol (1 : 1 : 8) and cleared and softened in a strong (±8 *N*) sodium hydroxide solution. Staining is accomplished in a 0·1% solution of water-soluble analine blue dye dissolved in 0·1 *N* K_3PO_4. The styles are smeared or are observed whole under a conventional or dissecting microscope by direct illumination with ultraviolet light of a wavelength of about 356 mμ. Observations are made in a darkened room. Under these conditions callose fluoresces bright yellow-green and contrasts strongly with the bluish or greyish fluorescence of the stylar tissue. The pollen tubes are outlined by a callose lining and irregularly spaced callose plugs. [Author's summary.]—Univ. Calif., Davis.

3180. Avakjan, A. G.
Recording the shape of fruits, leaves and other organs of plants. [Russian.]
Fiziol. Rast., 1959, **6**: 221-3, bibl. 6, illus.

An apparatus is described, whereby the details of plant organs can be drawn on the sheet of glass covering them and the drawings transferred to tracing paper.

3181. Wiggans, S. C., and Gardner, F. P.
Effectiveness of various solutions for simulating drouth conditions as measured by germination and seedling growth.
Agron. J., 1959, **51**: 315-18, bibl. 13.

Several chemicals were studied as to their effect in various osmotic-pressure concentrations on germination and seedling growth of radish and sorghum. Concentrations of 5 atmospheres of PVB [polyvinylpyrrollidone] and NaCl almost completely inhibited germination and radicle growth of both sorghum and radish, while 5-atmosphere concentrations of sucrose, glucose and D-mannitol had only a slight effect on reducing germination of radish and sorghum seed. Concentrations of 10 atmospheres or more greatly reduced or even completely inhibited germination. Suppression of germination and radicle elongation were qualitatively similar. The use of antibiotics and a fungicide up to 200 p.p.m. alone or in combination, or with a 2·5-atmosphere concentration of sucrose, had no consistent effect on germination and radicle growth. [Authors' summary.]—Iowa St. Coll.

3182. Hesse, W.
Einfluss des Wärme- und Wasserhaushaltes auf das Pflanzenwachstum. **(The effect of heat and water economies on plant growth.)** [English abstract 8 lines.]
Ber. dtsch. Wetterdienst., 1959, **7**(51): 29-34, bibl. 26, illus.

Techniques for the measurement of atmospheric heat and water balances are discussed with special reference to certain horticultural crops. Their effects on growth are also discussed.

Machinery and equipment.

(*See also* 3203h, l, 3204c, d, f, i, 3285, 3308b, c, z, 3369, 3372, 3376b, 3542j, 3559, 3575, 3625, 3723 l, 3879, 3943h, j, 4124h.)

3183. Richards, R. F., and others.
A versatile tractor-mounted plot sprayer using commercial components.
From abstr. in *Proc. 12th south. Weed Conf., 1959*, p. 198.

The sprayer [presumably for herbicide application] consists of 2 units and is mounted on a small, rear-engined tractor. The first unit consists of 3 containers connected in parallel to the boom with its own water supply, and the second of a conventional p.t.o. driven nylon roller pump sprayer.—Tenn. agric. Exp. Stat., Knoxville.—*Weed Abstr.*, **8**, No. 1356.

3184. Koppes, S., and Onderwater, L. N.
De motorrugnevelspuit. **(The motor knapsack mist sprayer.)**
Weekbl. BloembollCult., 1959, **69**: 662, illus.

Recommendations are given on the use of this sprayer in bulb crops. CIPC was successfully applied by the sprayer. An economic size of holding for the use of such a sprayer is 4 or 5 ha.

3185. Boyce, W. R., Gallagher, R. H., and Goldie, G. N. J.
Paint spray gun for spraying glasshouse crops.
N.Z. J. Agric., 1959, **98**: 253-9, bibl. 1, illus.
Paint spray-gun equipment for spraying glasshouse crops.
N.Z. Comm. Gr., 1959, **14**(8): 10-11, bibl. 1.

Two seasons' trials at the Levin Horticultural Research Station show that spraying with an ordinary paint spray gun is a convenient, effective, time-saving method with many advantages over other methods. The low volume, semi-concentrate spray material is carried to the plant in a stream of air. It is reckoned that a 100 × 30 ft. house with 1,000 tomato plants up to the wires can be sprayed in 40 minutes, i.e. about ⅓ the time necessary when a knapsack sprayer is used. Details are given of installation and the equipment necessary, namely, air compressor, couplings and spray gun itself.

3186. WIERSEMA, G. P.
Lichters in de tuinbouw. **(Lifters in horticulture.)** [English summary 5 lines.]
Meded. Dir. Tuinb., 1959, **22**: 154-7, 167, bibl. 2, illus.

Mechanical lifting tools for nursery crops and root vegetables generally give better results than lifting by hand. Three types of lifter are described, and their use is discussed.

3187. HIAM, N. J.
Improved method of using nursery tree wrencher.
N.Z. J. Agric., 1959, **98**: 249-51, illus.

An illustrated account is given of an implement which wrenches nursery trees prior to transplanting and thereby considerably facilitates the operation. The implement consists of a simple sledge-like contrivance, consisting of 2 angle-iron skids connected by a blade which curves to the depth below ground level at which roots are to be cut. The implement is drawn by a winch on which is wound $\frac{5}{16}$-in. or $\frac{5}{8}$-in. wire cables extending the full length of the nursery rows. An improvement on the old model [described *N.Z. J. Agric.*, 1954, **88**: 335-6] is that in the new model the back axle, differential and gear box of a car or light truck are used. They are mounted on an angle-iron frame, which is bolted to the rear axle fittings of the tractor, and being driven by the power take-off they act as a winch. The converted back axle wheels are replaced by drums with flanges large enough to take the length of cable used. The gear box is included to reduce the speed of the winch. Other details of construction and method of operation are here set out. It can be used for nursery trees or bushes.

3188. FRY, A. W., AND DAVIS, J. R.
Flow measurements for sprinkler irrigation systems.
Agric. Engng St. Joseph, Mich., 1958, **39**: 649-51, bibl. 2, illus.

Eight devices for measuring rate of flow in an aluminium sprinkler pipe were tested. The most accurate and easily made was a square-edged eccentric orifice. The orifice and pressure tap were used with an air-water manometer and proved suitable for field use.

3189. DIEM, M.
Messungen der Grösse der Regentropfen in natürlichen Regen und bei künstlicher Beregnung. **(Measurement of the size of natural rain drops and of drops produced by sprinklers.**
Beitr. naturk. Forsch. SüdwDtschl., 1956, **15**(2): 75-90, from abstract in *Gartenbauwiss.*, 1958, **23**: 76.

In comparison with rain drops, the sprinklers tested produced too high a proportion of small drops within a radius of 5 m. round the nozzles. The study demonstrates the contribution that agricultural meteorology has to make towards the improvement of sprinkler equipment.

3190. WELCH, H. J.
The mist propagator's manual. (Provisional edition.)
Roberts Electrical Co. Ltd., Humex House, High Road, Byfleet, Surrey, 1959, pp. 19, illus.

An account is given of the equipment and methods for mist propagation of cuttings used in the Humex system. The amount of mist supplied is regulated by a "sensitive balance" type of detector instead of by an electronic leaf. The importance of mixing soil with the rooting medium to facilitate the transplanting and establishment of rooted cuttings is stressed; a mixture of 1 soil/1 peat/2 graded sand or grit is recommended. Soil warming is considered to be essential if the full benefit of mist is to be felt. Various types of light plastic tent specially designed for mist propagation are described and illustrated by diagrams.

3191. TASMANIA DEPARTMENT OF AGRICULTURE, HORTICULTURE DIVISION.
Veneer tubes—an aid in plant propagation.
Tasm. J. Agric., 1959, **30**: 55-6, illus.

Tubes made by rolling thin, 9-in. × 3-in. sheets of plywood into cylinders and holding these with a rubber band have proved efficient and economical for raising cuttings and seedlings in the greenhouse.

3192. TSUKAMOTO, Y., AND OTHERS.
Der Einsatz von Kunststoff-Folien. **(The use of plastic films.)**
Gartenwelt, 1959, **59**: 193-201, illus.

Articles by several authors discuss various horticultural uses of plastic materials in Japan, France, the United States and Germany.

3193. NUERNBERGK, E. L.
Die Technik der Kunstlichtbeleuchtung. **(The technique of artificial illumination.)**
Angew. Bot., 1959, **33**: 71-92, bibl. 25.

The article deals chiefly with the quality of various types of illumination, the installation of the lamps, the timing and the duration of the illumination, the duration and intensity of the irradiation, plant irradiation in special cases, the migrating or moving light (Wanderlicht), and the physiological effects of intermittent irradiation.

3194. CRAIG, D. L.
Response of greenhouse crops to supplementary illumination during the winter months in Nova Scotia.
Canad. J. Plant Sci., 1959, **39**: 135-40, bibl. 9, illus.

Supplementary illumination [from 6 a.m. to 8 p.m.] produced a favourable growth response regardless of the type used. A consideration of operational costs and an analysis of data from (1) plant top dry weights, (2) plant height, (3) number of days to flowering of peas, beans, tobacco, snapdragons and strawberries shows that mercury vapour plus low intensity incandescent light was the best type of illumination when compared with mercury vapour alone, mercury fluorescent and incandescent light. [Author's abstract.]—Canada Dep. Agric., Kentville, N.S.

3195. KARMANOV, V. G.
The application of automation and cybernetics to plant cultivation. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1959, **126**: 207-9, bibl. 5.

The title of this paper implies the use of apparatus by means of which the plant controls its own environment. This is achieved by using changes in the plant's physiological processes to actuate the mechanisms which control light, temperature, soil moisture, air humidity and nutrition. Results of experiments with beans are described in which, with the aid of a special apparatus, changes in transpiration rate were used to control day length.

Greenhouses.

(*See also* 3203p, r, s, 3686, 3847, 3851, 4142.)

3196. BEATTIE, J. H.
Sash greenhouses.
Leafl. U.S. Dep. Agric. **124**, revised 1958, pp. 8, illus.

A sash greenhouse is a relatively cheap, temporary structure, intermediate between a hot-bed and a standard greenhouse, and uses one or more rows of sashes to form the roof. Plastic may be used instead of glass. Detailed descriptions and diagrams are given of 3 types, namely, the lean-to (12 ft. wide, with one side wall 8 ft. 6 in. high and the other 18 in.), the even-span (12 ft. wide, 5 ft. 4 in. high in the centre, with an excavated walk) and the uneven-span (similar but modified for use on sloping ground). Heating systems are discussed.

3197. LAWRENCE, W. J. C., SHEARD, G. F., AND BROWN, P. H.
Influence of glasshouse shape in east-west propagating houses.
Exp. Hort., 1959, No. 2, pp. 1-7, bibl. 3, illus.

The total transmission of light during January and February was measured in 2 east-west houses, that were equal in volume, but with an asymmetrical and a symmetrical cross-section respectively. Data from plant weight (tomato seedlings), temperature and sunshine records indicated that transmission of solar radiation by the asymmetrical house was higher than that by the symmetrical house during periods of bright sunshine. Light transmission was greater through the high south wall of the asymmetrical house, the slope of the glass being a less important factor in light transmission. Orientation has a far more important influence on light transmission than shape of the house.—John Innes hort. Instn, Fairfield exp. Hort. Stat., and Efford exp. Hort. Stat.

3198. NIELSEN, V.
Belastungsfähigkeit verschiedener Glasmasse. **(The strength of different glass sizes.)**
Gartenwelt, 1959, **59**: 207-8.

In Denmark light is the limiting factor for growing plants under glass. Experience and calculations have shown that a pane 90 cm. wide and 4 mm. thick is the maximum practicable size for a glasshouse.

3199. CHALLENGER, S.
Trials of plastic lining in glasshouses.
N.Z. J. agric. Res., 1959, **2**: 262-5, bibl. 4.

A plastic lining was inserted in the southern half of a partitioned glasshouse, the northern [sunnier] half being left unlined. Following a crop of Potentate tomatoes the lined and unlined halves of the house were reversed and a second crop of tomatoes, of the variety Moneymaker, was grown. The dominant factor in the trials was the difference in cropping capacity between the two halves of the house, the northern end outyielding the southern by 50%. The plastic lining resulted in a slight improvement in minimum temperatures and a slight increase in the early yield of the first crop of tomatoes which was planted on the 28 August [late winter]. The lining did not, however, result in a greater total yield.—Canterbury agric. Coll.

3200. JOHNSON, V. A., AND SCHMIDT, J. W.
Plastic replaces glass in greenhouse construction.
Neb. Exp. Stat. Quart., 1958, **5**(3): 9, 16, illus.

A new plastic and wood house, 18 × 80 ft., in two sections, each 18 × 40 ft., is described and illustrated. The material used outside is 0·004-in. polythene and inside 0·002-in. polythene. It has a steep roof angle of 40°, compared with the normal 33° for glass, and hence avoids accumulation of snow. It was unaffected by 50 m.p.h. winds. Polythene admits about 90% as much light as glass, and so some crops may need additional lighting during the winter, and since polythene deteriorates quickly it has to be replaced each year. This has the advantage that the plastic house is ideal for conversion to a summer shade house. Screen panels, 4×6 ft., were constructed for use on the roof of the house. This screening creates an excellent, semi-shaded, protected area for spring and summer propagation. Its initial cost was about 20% of that of a glasshouse. A list of materials required and a blueprint are available from the Department of Information, Administration Annex 104A, Univ. Nebraska.

3201. MOORE, E. L., AND RAY, K. R.
Building and using a plastic greenhouse.
Bull. Miss. agric. Exp. Stat. **563**, 1958, pp. 12, illus.
ANON.
Plastic greenhouses.
71st A.R. Miss. agric. Exp. Stat., year ending June 30th, 1958, p. 38, illus.

The design and construction of a plastic greenhouse (18 ft. wide × 60 ft. long) are described. An exhaust fan and heating system were included, and the initial cost of construction was $700. Subsequent annual cost is estimated as $200. Trials with 2 winter tomato crops showed that average yields per plant in the plastic house were lower than those expected from glasshouse plants; it is suggested that this was partly a result of inadequate heating during the abnormally cold winter, and of a reduction of light transmission by the double layer of polythene during cloudy weather, resulting in poor fruit set. The highest yields were produced by hybrids which had Tuckers Forcing as one parent. [Previously noted in *H.A.*, 28: 1068, and 29: 1552u.]

3202. LANGHANS, R. W., AND LEACH, A. D.
Greenhouse cooling?
Bull. N.Y. St. Flower Grs, 1959, No. 161, pp. 1-3.

Air temperatures in a glasshouse cooled by the pad-and-fan system were 10·3° F. cooler than those in a naturally ventilated glasshouse. Air temperatures with low pressure mists, high pressure fogs, and outside nozzles plus a fan were between these two extremes, but leaf temperatures were lowest with systems that maintained a film of water on the leaves. Results from studies on the effect on plant growth showed that in 2 cool summers glasshouse cooling was not beneficial.

Noted.

3203.

a ABBISS, H. W.
Shelter—its economic value.
Comm. Gr, 1959, No. 3310, pp. 1370-1.
Artificial and vegetative windbreaks discussed, with reference to work at Rosewarne.

b ANON.
Historial del Jardín de Aclimatación de Plantas de Orotava. (**Historical record of the Botanic Garden at Orotava [Canary Islands].**)
Bol. Inst. nac. Invest. agron. Madrid, 1958, **18**: 469-96, illus.

c BADRINAS, A.
Micro-determinación de Zn en material vegetal mediante ácido etilen-diamin-tetracético e indicador fluorescente. 1ª parte: Método. (**Micro determination of Zn in plant material by means of ethylene-diamine-tetra-acetic acid and a fluorescent indicator. Part 1: Method.**) [English summary 7 lines.]
Publ. Inst. Biol. apl., 1958, **28**: 75-80, bibl. 10.
For determining Zn and Ca+Mg.

d BANGA, O.
The Institute of Horticultural Plant Breeding [Wageningen]. [Dutch summary 6 lines.]
Meded. Inst. Vered. Tuinbouwgew. **147**, 1959, pp. 12, illus.
Organization and a summary of research programmes [a revision of *H.A.*, 25: 2316].

e BERGAMIN, H., JR.
Radioautografía de tecidos. (**Autoradiography of tissues.**)
Rev. Agric. Piracicaba, 1959, **34**: 41-9, bibl. 9, illus.
General technique, and application to P nutrition studies on coffee.

f BLUKET, N. A.
Causes of the replacement of the epidermis with cork in trees and shrubs during the period of starch minimum. [Russian, with English summary 8 lines.]
Izv. Timiryazev. seljsk. Akad., 1959, No. 1, pp. 49-58, bibl. 25, illus.
In fruit and ornamental species; associated with low night temperatures in late summer.

g BOOTH, A., AND OTHERS.
Use of radioactive tracers in studies of the shoot apex.
Nature, 1959, **183**: 1580-2, bibl. 2, illus.
A technique for obtaining autoradiographs of the whole surface area of the apex.

h BOUWER, H.
Integrating rainfall-evaporation recorder.
Agric. Engng St. Joseph, Mich., 1959, **40**: 278-9, bibl. 5, illus.
With a field-capacity ceiling and a lower mark indicating time to irrigate.

i COSSINS, E. A., AND TURNER, E. R.
Utilization of alcohol in germinating pea seedlings.
Nature, 1959, **183**: 1599-1600, bibl. 3.
Alcohol, accumulated anaerobically by soaking, was metabolized under aerobic conditions.

j DOMAN, N. G., and ŠKOL'NIK, R. JA.
Metabolism of C^{14}-sedoheptulose in the leaves of beans, tobacco and *Sedum spectabile*. [Russian, with English summary 11 lines.]
Biohimija, 1959, **24**: 187-91, bibl. 18, illus.

k FREEMAN, G. H.
The use of the same experimental material for more than one set of treatments.
Reprinted from *Appl. Statistics*, 1959, **8**: 13-20, bibl. 8.
In cases with and without interactions between sets of treatments.

l GREGORY, M.
An analysis of the failure of a spray irrigation scheme.
Tasm. J. Agric., 1959, **30**: 23-5.
Caused by too small diameter piping, inefficient pump and inadequate motor.

m GULJAKIN, I. V., AND JUDINCEVA, E. V.
Accumulation and distribution of radioactive fission products in organs of plants grown in sand culture. [Russian, with English summary 4 lines.]
Izv. Timiryazev. seljsk. Akad., 1959, No. 1, pp. 35-48, bibl. 4, illus.
Sr^{90} and Cs^{137} readily taken up by pea plants and accumulated mainly in aerial organs [see also *H.A.*, 28: 2120].

n HARRINGTON, J. F.
Moisture-proof seed packaging.
Reprinted from *Seed World*, 1958, **83**(4): 8, 10.
Desirable moisture contents and methods of drying seeds, and packaging materials.

o INSTITUUT VOOR PLANTENZIEKTENKUNDIG ONDERZOEK.
1949-1959—10 jaar I.P.O. onderzoek. **(1949-1959—ten years' of research at I.P.O.)**
Meded. Inst. PlZiekt. Onderz. **193**, 1959, pp. 123, bibl. numerous, illus.
A review of work at the Institute for research on plant diseases, Wageningen.

p (JOHNSON, C. A.)
Sun's effectiveness increased by aluminum in greenhouse.
Flor. Exch., 1959, **132**(20): 15, 36, illus.
Aluminium foil, backed by kraft paper, reflects available radiation when placed at strategic points.

q JOHNSON, C. M., AND ULRICH, A.
Analytical methods for use in plant analysis.
Bull. Calif. agric. Exp. Stat. **766**, 1959, pp. 25-78, illus.
Methods devised or used by the authors for quantitative determination of major and trace elements.

r KAZARIAN, E. A.
Plastic greenhouses.
Fm Build. Ser. Circ. Mich. St. Univ. **738**, 1958, pp. 4, illus.
Notes on construction, heating and ventilation. [See also *H.A.*, 29: 2087.]

s K(ETONEN), T. P.
Vaahtovinyyliä lavojen ja kasvihuoneiden peittämiseen. **(Polyvinyl foam sheets as covers for hotbeds and greenhouses.)** [English summary 2 lines.]
Puutarha, 1959, **62**: 154-6, illus.
Elaste, a commercial foam matting 1–2 cm. thick.

t KIMBALL, M. H., AND BROOKS, F. A.
Plant climates of California.
Calif. Agric., 1959, **13**(5): 7-12.
Zones of similar plant responses.

u MACEWAN, A. M.
Preparation of whole mounts of embryo sacs of plants.
Stain Tech., 1959, **34**: 157, bibl. 1.

v MALMSTADT, H. V., AND HADJIIOANNOU, T. P.
Rapid and accurate automatic titration method for determination of calcium and magnesium in plant material with EDTA titrant.
J. agric. Food Chem., 1959, **7**: 418-20, bibl. 11.
Using apple, cherry, citrus and peach leaves.

w MANSHARD, E.
Zur Frage der Nährstoffaufnahme der Pflanzen bei der Hydrokultur. **(On the uptake of nutrients by plants in soilless culture.)**
Gartenbauwiss., 1958, **23**: 447-53, bibl. 4.
With oats as test plants [see also *H.A.*, 29: 1077s].

x MAZZONI, R.
La luce e le piante. **(Light and plants.)**
Ital. agric., 1959, **96**: 323-34, bibl. 1, illus.
A review, including photoperiodism, use of coloured and extra-spectral light, and various types of artificial white light.

y NORRIS, W. E., JR., AND FOHN, C. H.
Demonstration of cytochrome oxidase in onion root tips.
Physiol. Plant., 1959, **12**: 90-9, bibl. 30.

z VAN OVERBEEK, J.
Auxins.
Bot. Rev., 1959, **25**: 271-350, bibl. 313.
A review, including the use of auxins for flower induction, fruit set, fruit thinning, root production and weed control.

3204.

a PENNELL, G. A., AND WEATHERLEY, P. E.
On the mechanism of sugar uptake by floating leaf disks.
New Phytol., 1958, **57**: 326-39, bibl. 23.
Experiments, using *Atropa belladonna*, to indicate the importance of metabolism in the process.

b Penningsfeld, F., and Reeker, R.
Torfkultur und Torf-Kultur-Substrate. **(Peat culture and peat media.)**
Gerhard Stalling A.G., Oldenburg, 1959[?], 8×5 in., pp. 33, bibl. 17, illus.
An illustrated review of experimental results [see also *H.A.*, 28: 1680, 2847 and 3796n].

c Raadsma, S.
Some methods of determining evapotranspiration.
[*Publ.*] *F.A.O.* **58/5/3887**, 1958, pp. 16, bibl. 40.
A review; the Gunn-Bellani Radiation Integrator is recommended for simple and accurate measurement.

d van 't Sant, G. F.
Machinaal planten van perspotten. (**Machine planting of soil block plants.**) [English summary 6 lines.]
Meded. Dir. Tuinb., 1959, **22**: 160-2, 167, illus.
Planting machines which can set about 1,800 plants in soil blocks per hour.

e Sapožnikov, D. I., Maevskaja, A. N., and Popova, I. A.
Quantitative determination of chlorophylls *a* and *b* by paper chromatography. [Russian, with English summary 3 lines.]
Fiziol. Rast., 1959, **6**: 376-9, bibl. 2.
Without destruction or loss of either chlorophyll *a* or *b*.

f Scott, V. H., and Houston, C. E.
Measuring irrigation water.
Circ. Calif. agric. Ext. Serv. **473**, 1959, pp. 52, illus.
Detailed description of devices and methods.

g Shepherd, F. W.
Alternative horticultural crops for Cornwall: 1.
Agriculture, Lond., 1959, **66**: 75-9.
Market garden crops suggested.

h Shneour, E. A., and Zabin, I.
The biosynthesis of lycopene in tomato homogenates.
J. biol. Chem., 1959, **234**: 770-3, bibl. 13.
Development of a technique for preparing and handling homogenates, etc.

i Strong, W. C.
El riego por aspersión en sus diversas facetas y aplicaciones. Observaciones sobre investigación en aspersores aplicadas a las condiciones de diseño. Frecuencias de riego y concepto de deposito. (**Sprinkler irrigation in its various aspects and applications. Investigations on equipment with regard to layout. Frequency of irrigation and the concept of water reserves.**)
Rev. Inst. agríc. catal., 1958, **107**: 172-5, 188-91, 205-10, illus.
A review.

j Sutcliffe, J. F.
Salt uptake in plants.
Biol. Rev., 1959, **34**: 159-220, bibl. 219.
A review, including mycorrhiza.

k Uryson, S. O., and Belozerskij, A. N.
The nucleotide composition of desoxyribonucleic and ribonucleic acids in certain higher plants. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1959, **125**: 1144-7, bibl.
Based on seeds, including those of bean, poppy, squash and onion.

l Washburn, W. H., Scheske, F. A., and Schenck, J. R.
Infrared determination of gibberellins.
J. agric. Food Chem., 1959, **7**: 420-2, bibl. 10.
Primarily of gibberellins X, A_3 and A_1 in mixtures.

TREE FRUITS, DECIDUOUS.

General.

(*See also* 4158.)

3205. Società Orticola Italiana and Société Pomologique de France.
Atti del Congresso Pomologico Internazionale, Firenze e Ferrara, ottobre 1958. (**Proceedings of the International Pomological Congress held at Florence and Ferrara in October, 1958.**)
Riv. Ortoflorofruttic. ital. (Special number), 1958, **42**: 467-770, illus.
[Also issued in French by Société Pomologique de France, as *Congrès pomol., 89^{me} Session, 1958*, 1959, pp. 306.]

This conference, held on the eve of the inauguration of the European Common Market, is of interest on that account, and the participants, largely French and Italian, included also members from the other countries concerned. Among papers given are accounts of the fruit-growing industry in Italy, France, Belgium, Holland and Germany with some consideration in each case of the problems inherent in the introduction of the Common Market scheme, with perhaps special emphasis on those facing Italy and France. Among other subjects dealt with are the following: apple storage disorders, the Mediterranean fruit fly, fruit tree nematodes, foliar diagnosis as a guide to the manuring of fruit trees, and the principles of orchard manuring. Certain other papers are represented by summaries only, though given in full in the French edition. [See separate abstracts of some of these papers.]

3206. Upshall, W. H., and others.
[Pear production in Canada.]
A.R. N. Scotia Fruit Grs' Ass. 1958, pp. 27-41.
Papers read and discussed at the Convention include: Pear production, handling and storage, by W. H. Upshall; Pear varieties [for Nova Scotia], by R. P. Longley; Growers' problems in pear production, by H. N. Cohoon; Factors and figures on pear production and consumption in N.S., by F. Scammell; Markets for fresh pears [in Nova Scotia], by A. E. Calkin; Marketing for processed pears [in Nova Scotia], by R. J. McGrath.

3207. van Heek, L. A. G., and others.
Field day, Tatura Horticultural Research Station.
J. Dep. Agric. Vict., 1959, **57**: 137-44, illus.
Four technical addresses are summarized, all of which deal with aspects of peach growing. Most of the important desiderata for establishing a young peach orchard are given in the first address, by L. A. G. van Heek. In the second, by J. Keatley, the use of chemical weedkillers in the orchard is discussed, and the results of the station's trials with kerosene, creosote, pentachlorophenol, amino triazole, dalapon and CMU are presented. The problems involved when an old orchard is to be replanted are the subject of the third paper, by B. T. Maher, while the final address, by M. W. Jarvis, is concerned with the interim results of a long term test of 6 methods of subsoil drainage, in which tile drains laid at depths of 27–30 in. and 15–18 in. have so far proved the most successful.

Breeding and varieties.

(*See also* 3308e, g, j, o, 3309f, g, j, p, q, s, v, y, 3310b, g, 3389, 3390, 3484e.)

3208. Neumann, D.
Die Wuchs- und Ertragsleistung von Apfelsorten in VE-Lehr- und Versuchsgut Eschenhörn. **(Growth and yield of apple varieties at the [East German] State College and Experimental Farm, Eschenhörn.)** [English and Russian summaries ½ p. each.]
Arch. Gartenb., 1959, **7**: 195-207, bibl. 4.
Data are tabulated for 48 apple varieties over the period 1952-57. In a comparison of 20 varieties the use of seedling rootstocks or of M.XI made little difference to growth and yields. For the 69 combinations tested (using seedling and various Malling rootstocks) a positive correlation existed between the volume of the top and average yields over 6 years. In 14 well known varieties the influence of biennial bearing on yields was great. —Inst. Acker- u. PflBau, Univ. Rostock.

3209. Einset, J., and Pratt, C.
Spontaneous and induced apple sports with misshapen fruit.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 1-8, bibl. 17, illus.
Six spontaneous sports in Rhode Island Greening, McIntosh and Northern Spy and one presumably thermal neutron-induced sport in Cortland are apparently chimeral. The fruits are characterized by longitudinal furrows of various degrees and, in 3 sports, by russet and cracking. Individual sports can be distinguished by their fruit. Irregularities in fruit could not be correlated with seed distribution. There is no evidence that the condition is caused by a transmissible virus. Two sports bear no normal fruit on affected branches and two occasionally produce a branch with normal fruit from an affected limb. Such behaviour suggests that they are periclinal chimeras resembling periclinal diploid-tetraploid chimeras. [Authors' summary.]—N.Y. St. agric. Exp. Stat., Geneva.

3210. Overcash, J. P., and Fahmy, I.
Crab apple varieties for Mississippi.
Miss. Fm Res., 1958, **21**(12): 3, illus.
Five crab varieties, Transcendent, Yellow Siberian, Hyslop, Dolgo and Florence, planted in Mississippi in 1938 have survived until 1958, whereas many standard apple varieties planted in the same year have died from disease or poor climatic adaptation. Data are given on tree size, fruit size and cropping capacity.

3211. Christensen, J. V., and Rasmussen, P. M.
Orienterende sortsforsøg med paerer. **(Preliminary trials with pear varieties.)** [English summary pp. 1½.]
Tidsskr. Planteavl, 1959, **63**: 134-72, illus.
Out of 46 pear varieties on quince tested, 15 varieties, which are described, were found to be satisfactory under Danish conditions. Quality and storage behaviour of the fruit were the chief characteristics studied. Data on harvest dates, yields and fruit size cover the period 1950-57.—Blangstedgaard.

3212. Fogle, H. W.
Inheritance of fruit color in sweet cherries.
J. Hered., 1958, **49**: 294-8, bibl. 2.
Seedlings from 15 variety crosses with Bing or Napoleon as female parents showed a monohybrid segregation of fruit colour in all except one cross. Skin colour gave red/white ratios of 7/1 for Napoleon crosses and 15/1 for Bing crosses, indicating incomplete dominant epistasis.—Irrig. Exp. Stat., Prosser, Wash.

3213. Kramer, S.
Beiträge zur Züchtungsforschung beim Pfirsich. II. Morphologische und physiologische Untersuchungen an Pfirsichsorten *Prunus persica* (L) unter besonderer Berücksichtigung der, "kernechten" Sorten. **(Contribution to research on peach breeding. II. Morphological and physiological studies on peach varieties, with special reference to varieties which come true from seed.)** [Russian and English summaries 17 and 15 lines.]
Arch. Gartenb., 1959, **7**: 112-54, bibl. 100.

In seedlings of the varieties Proskauer and Kernechter vom Vorgebirge the following characters were studied: length, width and thickness of the fruit and the stone, and length and width of the leaf and the bud. Within each organ the measurements were found to be inter-related. Fruit and stone proved to be more suitable for varietal identification than leaf or bud. Other characteristics assessed were period and progress of vegetation, progress of ripening, growth increments and frost resistance. No relationship was detected between the blossoming and ripening dates or between the ripening dates and leaf drop. Growth increments were correlated with yield. The degree of frost resistance was shown to be specific for individual organs. Varieties coming true from seed were more winter-hardy than clonal varieties.—[For part I, see *H.A.*, 27: 81.]—Inst. Obstb. Humboldt Univ. Berlin.

3214. Morris, H. F.
Performance of peach varieties in East Texas.
Bull. Tex. agric. Exp. Stat. **913**, 1958, pp. 36, bibl. 25.

The trial reported in this bulletin was started in 1948, with 130 varieties and selections, and the results up to the 1957 crop are tabulated and discussed. Each variety is briefly described. Recommendations are made on varieties to plant for home orchards, local sale and distant marketing.

Propagation and rootstocks.

(*See also* 3187, 3308h, p, r, v, w, 3309d, u, x, 3951.)

3215. Tubbs, F. R.
The living tree.
J. roy. hort. Soc., 1959, **84**: 107-20, 167-78, illus.

The Masters Memorial lecture takes the form of a review on the inter-relations of root and shoot and stock and scion, and of the effects of environment on tree growth, illustrated largely by references to work at E. Malling Research Station.

3216. Souty, J.
Il problema della selezione clonale e della moltiplicazione agamica in frutticoltura. **(Clonal selection and vegetative propagation in the orchard.)**
Riv. Ortoflorofruttic. ital., 1958, **42**: 500-9. [French edition in *Congrès pomol.*, *89me Session, 1958*, 1959, pp. 33-44.]

The writer's whole paper is actually a plea for the adoption, preferably on an international basis, of an organization or of organizations which would ensure the possibility of obtaining healthy fruit specimens typical of the very best varieties known under particular names, worked on healthy rootstocks true to type. He underlines the dangers of virus infection in vegetatively produced rootstocks, and the necessity of being able to guarantee freedom from infection in those used. He points to advances made in quick methods of propagation, instancing the stratification at a low temperature of cuttings prior to hormone treatment, mist propagation and the use of leaf cuttings, and certain precautions necessary in the application of such methods. He notes that greater facilities for rooting difficult species might help in some cases towards the use of species on their own roots, but, without supervision, would lead to supplies becoming increasingly more diseased.

3217. Brase, K. D., and Way, R. D.
Rootstocks and methods used for dwarfing fruit trees.
Bull. N.Y. St. agric. Exp. Stat. **783**, 1959, pp. 50, bibl. 39, illus.

European work on dwarfing stocks for apple, pear, cherry, peach and plum trees is summarized, and its application to nurseries and orchards in the United States is indicated. *Apples.* M.II, VII and IX have proved satisfactory in the U.S. as dwarfing or semi-dwarfing stocks, and M.VIII as a dwarfing interstock. *Malus baccata mandshurica* seedlings are recommended as hardy, semi-dwarfing stocks, and *M. sikkimensis* is useful because it is apomictic, though it may induce virus symptoms in some varieties. The Geneva and Clark systems of producing apple trees with a dwarfing interstock and 3 or 4 components are described. The temporary dwarfing effect of an inverted bark ring of the scion, and the permanent effect of a bark ring of M.IX are compared. Certain aspects of propagating clonal rootstocks are considered. *Pears.* Only Quince A has proved suitable at Geneva. Quinces B and C lack winter hardiness and C is very susceptible to leaf spot. Old Home is useful as a fire-blight-resistant framework interstock. *Cherries.* Stockton Morello cannot be recommended as a dwarfing rootstock for sweet cherries until a virus-free source is established, but Northstar Morello, of which virus-free wood is available, makes a good dwarfing interstock on mahaleb. In recent tests *Prunus fruticosa* has shown promise as a growth-restricting stock or interstock for sweet and sour cherries. *Peaches. P. tomentosa*, virus-free *P. besseyi* and Manchu apricot seedlings are recommended. *Plums.* Beauty and Pearl plums and Stanley prune have done well on the dwarfing *P. besseyi* stock, but it is not recommended for *P. insititia* varieties.

3218. Ślaski, J.
Wstępne badania nad wegetatywnym rozmnażaniem drzew owocowych bez podkładek. **(Preliminary studies on vegetative propagation of fruit trees.)** [English summary ½ p.]
Pozn. Tow. przy. Nauk, 1959, **5**(2): 3-79, bibl. 50, illus.

Methods of propagation by cuttings and layering were tested for raising top fruits on their own roots. With apples, cherries (sour and sweet), pears and plums, root cuttings or layers were most successful. Peaches were propagated by softwood cuttings or by layering. Rooting was stimulated by the use of hormones.

3219. Řetovský, R.
Die Bioteknose beim Apfelbaum. **(Viviparous germination of apple seeds.)** [Czech and Russian summaries ⅓ p. each.]
Biol. Plant., Prague, 1959, **1**: 31-8, bibl. 14, illus.

Criteria for estimating the vitality of embryos extracted from apple fruits of varying maturity during storage were the rate at which the cotyledons became green and the growth rate of the roots. The cotyledons of embryos of seeds in Klarapfel fruits became green most quickly in March, when the fruit was no longer edible. No viviparous seeds were found in Klarapfel fruits. The vitality of Wealthy embryos was relatively low at the beginning of storage, but increased with age to a maximum in January. From March onwards a few germinated seeds were found in Wealthy fruits. There were 2 peaks of embryo vitality in Ontario fruits, the first in the second half of winter, and the second in early summer. Germinated seeds were frequently found during July and August in Ontario fruits from the previous year's harvest.—Inst. Biol., Prague.

3220. Säkö, J.
Sahajauhopeitteen käytöstä omenapuuperusrunkojen suvuttomassa lisäyksessä. **(The use of sawdust in propagating rootstock clones in stool beds.)** [English summary ¼ p.]
Maataloust. Aikakausk., 1959, **31**: 98-102, bibl. 6, illus.

The number of well-rooted shoots from *Malus robusta* No. 5 in stool-beds was doubled when wet sawdust was used instead of soil for earthing up. Roots were heavier and longer, with more roots per shoot, and rooting occurred over a longer shoot section with sawdust than with soil.—Dep. Hort., Piikkiö, Finland.

3221. Hilkenbäumer, F.
Spross- und Wurzelausbildung bekannter vegetativ vermehrter Apfelunterlagen im 18. Standjahr in Heimbach/Schwäbisch Hall. **(Shoot and root development of vegetatively propagated apple rootstocks growing for 18 years at Heimbach/Schwäbisch Hall.)**
Reprinted from *Obstbau*, 1959, **78**(3): 1-5, illus.

Excavations show that in a clay soil the roots hardly reach the drip of the crown. Many photographs and drawings show how root growth of East Malling stocks was checked by unsuitable soil conditions.

3222. Kemmer, E.
Über die Anfangsentwicklung von Standbäumen selbst bewurzelter Apfelsorten. **(On the initial development of apple trees on their own roots.)**
ErwObstb., 1959, **1**: 54-7, bibl. 7, illus.

Hatton and, more recently, de Haas had shown that the growth and yield performance of apple varieties on their own roots was inferior to that on rootstocks. The author's results obtained in experiments at Friesdorf/Bad Godesberg agree with these findings, but his 111 own-rooted trees (25 varieties) at the Berlin-Dahlem institute exhibit the opposite tendency. Disregarding the first two years, the varieties Golden Delicious, Oldenburg, Allington, Landsberger Reinette and James Grieve on their own roots yielded an average of 18·6 kg. per tree annually from their third to their seventh year, the average for all varieties being 11·4 kg. as compared with less than 1 kg. at Friesdorf. The causes of this discrepancy have not been discovered. A table comparing 6 varieties at Berlin-Dahlem shows the definite superiority of own-rooted trees over trees on M.IX, except for Beauty of Bath and Boskoop. Among the own-rooted trees the difference between the best and the worst tree was also much smaller than on M.IX.

3223. Karnatz, H.
Untersuchungen über die Frostresistenz der Apfelsämlingsunterlagen Bitterfelder und Grahams Jubiläum im veredelten Zustande. **(Studies on the frost resistance of the apple seedling rootstocks Bitterfelder and Graham's Jubilee after budding.)**
Mitt. ObstVersuchsringes Jork, 1959, **14**: 105-6, bibl. 1.

The apple varieties Cox's Orange Pippin and Goldparmäne proved somewhat hardier on Graham's Jubilee than on Bitterfelder. Data on the frost resistance imparted by A2 are also tabulated.

3224. Sörgel, P.
Apfelstammbildner-Prüfungen im Baumschulstadium. **(Tests of apple stem-builders in the nursery stage.)**
Ber. Bayer. Arbeitsgemeinsch. Obstb., 1958, **2**: 2-63, bibl. 9.

As a rule, the vigour of stem-builder varieties worked on M.XI was inferior to that of the same varieties worked on seedlings. In some cases the uniformity of the varieties on seedlings was remarkable. The hardiness of the stem-builder varieties was to some extent influenced by the rootstock.

3225. White, R. G.
Stem builders for apple trees. Mulches for apple trees.
Progr. Rep. exp. Fm Fredericton N.B., 1953-1957, 1959, pp. 21-3.

Comparison of the behaviour of 64 trees of 9 commercial apple varieties grown as normal nursery trees and of 54 trees topworked on Antonovka during the years 1953-57 shows the very great value of topworking on a hardy rootstock as a means of avoiding winter injury. Trials since 1944 on 9 mature Cortland apple trees show the advantage of mulching with sawdust, oat straw or softwood shavings. A small amount of supplemental nitrogen was applied to the sawdust mulch. Soil samples taken in 1944 and again in 1956 show marked changes in pH, organic matter and mineral content. Shavings were as beneficial as straw and superior to sawdust.

3226. Nelson, S. H., Blair, D. S., and Roy, P. O.
Observations on the structural strength of certain apple stem builders.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 16-26, bibl. 20, illus.

A survey of orchards was made at 18 locations in the Provinces of Ontario and Quebec to study the structural strength of 23 stem builders. Severity of injury was indexed, and results are presented on the amount of limb twisting, limb splitting, socket pulling, crotch splitting and ultimately the number of branches lost. Narrow crotches and rough unions are also recorded. Varieties on Anaros, Wapella and Pioneer lost more than 10 %of their branches; on Patten Greening, Osman, Robin, Hibernal, Virginia Crab, Antonovka and Columbia more than 4% of the branches were lost, while on Hardy Crab, Charlamoff, *Malus baccata*, Anis and McMahon White the loss ranged from 2·50 to 0·81%. Although not entirely free of injury, no branches were lost where Garnet, Redman, Martin, Toshprince, McPrince, *Malus robusta* 5, a Piotosh × Ostrakoff selection and a Mecca × Dolgo selection were used as stem builders. The index rating for injury of the Mecca × Dolgo selection was the lowest, followed closely by the Piotosh × Ostrakoff selection and *Malus robusta* 5. Varieties with an upright growing habit caused more limb twisting and limb splitting; heavy horizontal branches tended to cause more crotch injury. Structural strength can be increased by proper selection of branches and grafting distances, and with correct training and pruning of the topworked material breakage can be greatly reduced with Hibernal and Antonovka. [From authors' summary.]—Cent. exp. Fm, Ottawa.

3227. Christensen, J. V.
Forsøg med forskellige grundstammer til paerer. II. 1935-1957. (**Pear rootstock trials. II. 1935-1957.**) [English summary ⅔ p.]
Tidsskr. Planteavl, 1959, **63**: 34-44.

Results for the period from planting in 1935 until 1949 were reported in detail in Part I [see *H.A.*, 23: 2564]. In the present paper data are presented for the whole period on tree growth, on yields per tree per year, yields per hectare and total yields, and on fruit size. With all varieties tree growth, expressed in terms of crown diameter, was biggest on the free pear clone D and smallest on Quince C. With the vigorous varieties Hardy and Comice the highest yields, except in the early years, were obtained on Quince A, while Conference and Bartlett cropped best on the two free pear clones. As regards yields per hectare, Comice and Hardy scored highest on Quince A, but they were surpassed by Conference and Bartlett on the pear seedling stocks. On the whole, trees produced the largest fruits on the two quince stocks.—Blangstedgaard.

3228. Lapins, K.
Some symptoms of stock-scion incompatibility of apricot varieties on peach seedling rootstock.
Canad. J. Plant Sci., 1959, **39**: 194-203, bibl. 11, illus.

In connection with apricot breeding, simple methods were sought for detecting stock-scion incompatibility between apricot varieties or seedling selections as scions and peach seedlings as rootstocks. Several incompatibility symptoms were studied, mainly those associated with structural weakness of the graft union. Smoothness of break at the union and discontinuity of wood and/or bark tissues were found to be reliable symptoms of incompatibility between apricot scion and peach rootstock. Highly significant correlations were found to exist between the above three observations. Examination of discontinuity of bark tissue is considered to be the simplest and, since it does not destroy the tree, the most practical method of determining the incompatibility status of apricot seedling selections. [Author's abstract.]—Canada Dep. Agric., Summerland, B.C.

3229. Nicolin, P.
Auslese nichtharzender Vogelkirschen. (**The selection of non-resinous mazzard cherries.**)
Dtsch. Baumsch., 1959, **11**: 108.

After 15 years of selection work on the cherry rootstock Limburger Vogelkirsche, imported from

Eastern Holland, two clones, Preussen and Königsberg, have satisfied all requirements.

3230. Hilkenbäumer, F.
Vergleich von Trieb- und Ertragsleistungen von Schattenmorellen in den ersten sechs Standjahren auf verschiedenen Standorten, Unterlagen, Stammbildern und bei unterschiedlicher Schnittbehandlung. **(A comparison of growth and yields of morello cherries during the first six years in different localities, on different rootstocks and stem-builders and with different pruning treatments.)**
ErwObstb., 1959, **1**: 7-11, bibl. 5, illus.

Locality: The influence of soil condition on performance was considerable. *Rootstocks and stem-builders.* In respect of compatibility and longevity *Prunus mahaleb*, as a rootstock or interstock, proved greatly inferior to *P. avium.* Where incompatibility did not interfere, however, yields were greater on *P. mahaleb*, but fruit size was larger on *P. avium.* In several cases the *P. avium* clone F.12/1 gave better results than seedlings of *P. avium.* In spite of its disadvantages, *P. mahaleb* may, in the author's view, still have to be used on the poorer soils. *Pruning:* Leaving minor shoots, not necessary for the build-up of the crown, as future fruiting wood accelerated and increased yields in the early years without disturbing the structure of the top. The formation of new shoots on one- and two-year-old wood was stimulated by light pruning. More severe pruning and rejuvenation of the limbs led to an increase in fruit size in the same year, but to a considerable reduction in yield in the following year. If the extension growth in younger crowns was cut back annually, the regular pruning of lateral shoots was superfluous. Lateral shoots, however, must be pruned when bareness in the crown becomes increasingly apparent and when the fruit size drops below grade A standards. On the whole, frequency and severity of pruning are determined by the rootstock, the soil and the level of manuring.—Inst. Obstb., Bonn Univ.

3231. Pollock, B. M.
Temperature control of physiological dwarfing in peach seedlings.
Nature, 1959, **183**: 1687-8, bibl. 6.

Elberta peach seeds, which had not been after-ripened at low temperatures, but had had seed-coat and endosperm excised for ⅓ the length of the seed at the hypocotyl end, were germinated for 7 days in light and in darkness at 19°, 23° and 27° C. The extent of physiological dwarfing was assessed after a 5-week growing period. There was very little difference between plants from seeds germinated in light or in darkness. The major effect of temperature was on the development of certain dwarfing symptoms such as telescoped internodes and reduced and deformed leaves. At 19° C. all plants were normal, at 23° C. a few plants were dwarfed and of these a few were severely so, while at 27° C. all were severely dwarfed.

3232. Singh, U. P.
Embryony in loquat (*Eriobotrya japonica* Lindl.).
Curr. Sci., 1959, **28**: 162-3, bibl. 4, illus.

The dissection of 50 seeds from each of 10 varieties of loquat failed to reveal any multiple embryos. The germination of a further 100 seeds of each variety, however, resulted in the production of a number of seedlings with multiple shoots, ranging from none in Long White to 29·63% in Fire Ball. The plants with multiple shoots had only one root and were therefore not polyembryonic.—Hort. Res. Inst., Saharanpur.

Growth and physiology.

(*See also* 3144, 3308s, 3391.)

3233. Kolesnikov, V. A.
The growth of axial and absorbing roots of top and small fruit plants throughout their annual life cycle. [Russian, with English summary ¼ p.]
Izv. Timiryazev. seljsk. Akad., 1959, No. 1, pp. 127-48, bibl. 28, illus.

The root systems of top and small fruits show no dormant period if growth conditions are satisfactory, but new roots develop and older roots die off continuously throughout the year. There is usually, however, a rhythm in the growth rate of both skeletal and feeder roots, with one or more flushes of higher activity, the spring flush being the greatest, and the autumn one being omitted under drought conditions unless irrigation is applied. The rate of root growth varies with depth. The development and decay of the feeder roots are affected by species, rootstocks and scion varieties, age, yielding capacity, environment and cultural practices. [See also *H.A.*, 25: 3552 and 26: 195.]

3234. Nesterov, Ja. S.
Flower bud initiation and the differentiation of parts of flowers in apple trees. [Russian, with English summary ½ p.]
Fiziol. Rast., 1959, **6**: 176-82, bibl. 9, illus.

In the foothills of the Krasnodar region apple flower buds begin to form at the end of June and by September–October are fully differentiated. When spurs were grafted on to vigorous non-dormant rootstocks to ensure adequate nutrition, differentiation and development of the grafted flower buds took 30–40 days, as against 9–10 months under natural conditions, since with a continuous supply of nutrients buds can develop without the normal winter chilling period. Both the number and the structure of the flowers were affected by variety and environmental conditions. Nutrient deficiency caused under-development in the flowers and a reduction of their number in the inflorescence, while excess of nutrients caused the reproductive organs to become vegetative and transformed the flowers into shoots.

3235. Hořavka, B.
Observation of IEP_M values of growing points of flower buds of the apple during the period before their morphological differentiation. [Czech and Russian summaries ½ p. each.]
Biol. Plant., Prague, 1959, **1**: 16-21, bibl. 8.

From June 11 to July 7 (1957) mean isoelectric point (IEP_M) values in the meristematic tissue of flower buds and in phloem and xylem of flower buds and growing spurs were fairly stable in the 3 apple varieties studied. Between July 9 and August 11 there was a shift in IEP_M values towards the area of higher pH, followed by a drop to the original IEP_M values, which coincided with the start of morphological differentiation of flower buds.—Inst. Biol., Prague.

3236. Piringer, A. A., and Downs, R. J.
Responses of apple and peach trees to various photoperiods.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 9-15, bibl. 11.

The responses of Jonathan apple and Elberta peach trees to photoperiods of 8, 12, 14 and 16 hours were studied. Photoperiods were provided by extending a basic 8 hours of natural light in the greenhouse with additional low-intensity incandescent light to complete the photoperiod. Main stem length of both apple and peach were affected by photoperiod; in apple the longest stems occurred on the 16-hour photoperiod and in peach on photoperiods of 12 hours and longer. The kind of supplemental light, incandescent or fluorescent, used to extend the photoperiod was found to have a differential effect on apple on the 16-hour photoperiod, the only photoperiod tested. The incandescent source induced longer main stems and less branching but a flushing type of growth. Growth in fluorescent light was without flushes. Flower buds were initiated and developed in incandescent light, but not in fluorescent light despite the greater number of actively growing buds. Previous photoperiod had no effect on the survival of plants of apple and peach at Beltsville during the winter of 1957–58. [Authors' summary.]—U.S. Dep. Agric., Beltsville, Md.

3237. Schossig, S.
Temperatursummen — eine Bestimmungsmöglichkeit für die Vorhersage des Blühbeginns bei Birnen. **(Temperature sums—a possible means of forecasting the onset of flowering in pears.)**
Dtsch. Gartenb., 1959, **6**: 105-6, bibl. 2.

During the 6 years of observation (1952–57) on 12 pear varieties, an average of 3,435 degrees C. above a threshold value of 6° C. was required after the 1st January before 10% of their blossoms opened. This sum was calculated by reading the temperature at hourly intervals and by adding together all the temperatures above 6° C.—Versuchsstat. Magdeburg-Ottersleben.

3238. Henze, J.
Untersuchungen über den Kohlenhydrat-Eiweiss-Haushalt der Rinde in seiner Beziehung zur Frostresistenz von Obstgehölzen. **(Studies on the carbohydrate-protein balance in the bark of fruit trees in relation to their frost resistance.)**
Reprinted from *Z. Bot.*, 1959, **47**: 42-87, bibl. pp. 5½.

Certain metabolic changes in the bark of the apple varieties Cox's Orange, Zuccalmaglio, James Grieve and Weisser Klar were studied from October, 1955, to March, 1957. It was confirmed that a negative correlation exists between the water content of the tissue and its frost resistance. Nitrogen determinations showed that the content of soluble and total N rises in the course of natural hardening. The absolute content of total N and the proportion of soluble N were lowest in Cox's Orange, which is in line with its limited frost resistance. Special and newly developed methods made it possible to identify and to determine quantitatively both the free and the bound sugars. Only in one respect did the concentration of free hexoses and pentoses show any clear relationship to frost resistance. The concentration of free sugars rose as resistance increased with natural hardening, the content of pentoses showing a maximum in November, while hexoses continued to increase until February. Total hexoses were at their maximum in February; they decreased from August to November and thus showed a tendency opposed to that of increasing frost resistance. By contrast, total pentoses rose during natural hardening, a higher content of pentoses being related to a higher degree of resistance in a variety. The arabinose content showed the same typical changes in concentration as did free and total pentoses; in James Grieve and Weisser Klar, but not in Cox's Orange, these differences amounted to about 100%. A method is described by which different protein fractions were separated, one of which was identified as a protein-carbohydrate complex. The protein component was a polypeptide consisting of 6 amino acids and the carbohydrate was arabinose. The rise in the content of protein-bound arabinose corresponded to that of soluble N. Here the relationship to frost resistance was particularly clear: (1) The concentration of protein-bound arabinose and of soluble N rose with the changing degree of frost resistance during natural hardening, and (2) the content of these compounds was about twice as high in the hardier varieties, James Grieve and Weisser Klar, as compared with the more tender variety Cox's Orange. The results emphasize the importance of pentoses, especially arabinose, for frost resistance. From a comparison between protein and sugar contents, and from the changes in their concentration during natural hardening, it is believed that the effect of pentoses on frost resistance is due to a three-fold protective action.—Inst. Obstb., Univ. Bonn.

3239. Hutchinson, A., Taper, C. D., and Towers, G. H. N.
Studies of phloridzin in *Malus*.
Canad. J. Biochem., 1959, **37**: 901-10, bibl. 22.

The phloridzin content of dormant terminal twigs of *Malus* rootstock clones was not related to the vigor imparted to the scions. In young seedling trees it varied with the nutritional status of the plant; an acute deficiency of nitrogen, sulphur, or calcium resulted in a significant increase in phloridzin accumulation. Phloridzin is synthesized readily in the leaf from $C^{14}O_2$ in the light and appears to be stable once formed. Phenylalanine-C^{14} and tyrosine-C^{14}, when fed to leaf disks, are incorporated into the C_6–C_3 moiety of phloridzin which includes ring B. Tyrosine is not as effective as phenylalanine. Acetate-C^{14} is incorporated into ring A. Phloroglucinol is not involved in the synthesis of phloridzin. A method for the quantitative determination of phloridzin is described, also a semimicro method for its alkaline hydrolysis. The large amounts of radioactive D-glucitol formed from a wide variety of precursor compounds indicate a central role for it in the carbohydrate metabolism of *Malus*. [Authors' abstract.]—McGill Univ., Montreal, and Macdonald Coll., Quebec.

3240. Liebster, G., and Kettner, H.
Versuche mit Gibberellinsäure im Obstbau. **(Experiments on the use of gibberellic acid on fruit trees.)**
ErwObstb., 1959, **1**: 19-20, 25-8, bibl. 6, illus.

Responses to treatment with gibberellic acid were observed in experiments on young apple and pear trees grown in containers, on apple trees grown in the field, on scion wood of apple and pear varieties used in grafting, on pollen of apples, pears and strawberries and on growing apple fruits. In no case were the results encouraging, and no future commercial application of GA is envisaged.—Inst. Obstb., Weihenstephan-Freising.

3241. Stiles, W. C.
Effects of growth regulating chemicals on apparent photosynthesis of apple leaves.
Diss. Abstr., 1958, **19**: 1155-6, being *L.C. Card No. Mic.* 58-7306 of 136 pp.

Preliminary experiments with Rome Beauty showed that NAA at 20 and 40 p.p.m. applied on July 12 did not significantly affect the rate of apparent photosynthesis or per cent reflectance of the treated leaves. NAA applied on August 16, at 20 and 100 p.p.m., significantly reduced the rate of apparent photosynthesis. An 80 p.p.m. spray of 2,4,5-TP applied on September 8 reduced the rate of apparent photosynthesis and intensity of leaf colour. Leaves from trees treated with 40 p.p.m. 2,4,5-TP on September 20 showed a reduction in dry weight per sq. cm., while control leaves and those treated with 80 p.p.m. showed increases. In further tests treatments of 10 and 20 p.p.m. NAA were applied during May and did not affect the average rate of apparent photosynthesis per sq. cm. or per mg. of dry weight; they did, however, reduce leaf area, leaf dry weight, terminal shoot growth and percentage of first shoot to total shoot length. Later treatments had increasingly greater effects on first shoot growth. When 2,4,5-TP was applied in August to McIntosh trees, sprays of 10 p.p.m. significantly reduced rates of apparent photosynthesis, while 20 p.p.m. significantly increased them. Concentration and date of application were not associated with marked differences in leaf colour. Leaves from treated trees decreased in dry weight per sq. cm. from the first to the second date of application, while those from control trees showed increased dry weight.—Pa St. Univ.

3242. Maxie, E. C., and others.
Distribution of C^{14} from carboxyl-labeled 2,4,5-trichlorophenoxyacetic acid in fruit tissues of Tilton apricot.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 134-44, bibl. 19.

Sprays of 2,4,5-T applied to apricot trees at the time of pit hardening increase fruit size by stimulating cell enlargement. Radioactive 2,4,5-T was used to study the mode of action of the auxin, whole branches, fruits only, or leaves and branches of Tilton apricots being sprayed at the time of pit hardening. C^{14} could be detected in the fruit mesocarp 3 days after treating whole branches. The C^{14} activity in the flesh declined as the fruit grew. No C^{14} activity was detectable in the embryos and integuments 3 days after treating whole branches, but activity was apparent after 10 days and it increased with time until the fruit was mature. The highest C^{14} activity was in the integuments, where at least a part of the C^{14} was still in the intact 2,4,5-T molecule. A net accumulation of C^{14} occurred in the integuments as the season progressed. 2,4,5-T was shown to be absorbed by both leaves and fruit. A surfactant added to the spray solution markedly increased the C^{14} activity in the fruit tissues. The fresh weight, dry weight and carbon content of the integuments declined as the fruits grew.—Univ. Calif., Davis.

3243. Schneider, A.
Annual variations in free amino-acids of the peach tree. [French .]
C.R. Acad. Sci., Paris, 1958, **247**: 1034-7, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-257.

Organic N increased in the peach tree in the spring, especially in the buds. It decreased in the leaves during the last few days before they dropped; meanwhile all amino-acids except alanine and aminobutyric acid increased in the twigs. Arginine was very abundant in winter, especially at the base of the twigs, decreasing in spring, and was more abundant in old than in young leaves. Ratios of aspartic to glutamic acid and of citric to malic acid in winter were high in the buds, but low in the twigs, decreasing in spring, and from young to old leaves. The ratio of asparagine to aspartic acid rose in spring, was lowest at the end of the summer, and was higher in leaves from the middle of the twigs than in those above or below.

Soil problems and management.

(*See also* 3225, 3260, 3310f, 3385.)

3244. Raw, F., and Stephenson, J. W.
Earthworm populations in orchards.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 142.

In an orchard where 85% of the leaves falling in autumn remained on the surface until spring, few earthworms were found in the soil. In other orchards where only 2–15% of dead leaves remained, the earthworm populations were estimated at 300,000–500,000 per acre. Of the 6 species present, *Lumbricus terrestris* was most active in removing leaves from the soil surface. A method of estimating the earthworm population and the rate of leaf burial is described. [For previous work see *H.A.*, 28: 3401d.]

3245. (Doll, C. C.)
Compare grasses used as orchard cover crops.
Ia Fm Sci., 1959, **13**: 226.

In trials with various grasses used as orchard cover crops, sand lovegrass (*Eragrostis trichodes*], sideoats grama [*Bouteloua curtipendula*] and Kentucky bluegrass [*Poa pratensis*] showed the least competition with apple trees for water and nutrients, provided enough soil cover to prohibit weed growth, and did not need frequent mowing. The water requirements of these grasses were the lowest of all cover crops tested.

3246. Coker, E. G.
Root development of apple trees in grass and clean cultivation.
J. hort. Sci., 1959, **34**: 111-21, bibl. 12, illus.

The rooting of four 16-year-old apple trees grown in grass for nearly 10 years was compared with that of similar trees grown in clean cultivation throughout; both excavation and sampling methods were used. Roots of 16 other trees were studied by sampling. Many roots grew up into the surface soil under grass and into the turf itself, and ramified there. Under cultivation few roots grew near the surface. Trees in grass had a more branched root habit and more fibrous roots at all depths than those in cultivation. The general conformation of main roots and the depth of root penetration were similar under grass and cultivation. Under cultivation some trees studied did not fully explore the soil block, but comparable trees in grass explored a greater area of soil. Other larger cultivated trees were found to be exploiting the entire soil area. [From author's summary.]—East Malling Res. Stat., Kent.

3247. Fuss, F.
Veränderung des Bodenklimas durch Bodenbedeckung bei ausdauernden Kulturen. **(Changes in the soil climate resulting from mulching soil under perennial crops.)**
Angew. Meteor., 1958, **3**: 74-6, from abstract in *ErwObstb.*, 1959, **1**: 20.

In trials carried out at Dresden-Pillnitz during 1952-54 mulching the soil under bush apple trees with 1·5 kg. rape straw per sq. m. reduced the maximum temperature in the top layer of the soil by 11° C., as compared with uncovered soil, and the absolute annual variation by 21·1° C. In a "climate hut" with an air temperature of −16° C. the temperature of the top layer of uncovered soil was 6·6° C. lower than that of the mulched soil. The variation of moisture values in covered soil was only half that in uncovered soil. Soil covering prevented both supersaturation of the top layer during heavy rainfall and crust formation or drying out during drought. The effect of a mulch of 1·5 kg./sq. m. was maintained by adding 0·5 kg. of straw each year to the original cover. An experiment on the amount of mulching material to be used showed that 1·5–2·5 kg./sq. m. was, in general, the most effective and profitable amount. [See also *H.A.*, 29: 1208.]

3248. Burmistrov, A. D.
Spacing row crops in orchard interrows. [Russian.]
Sad i Ogorod, 1959, No. 3, pp. 45-6, illus.

A description is given of a complex system of intercropping young apple and other orchards, planted on the square, with strawberries or vegetables. The spaces in the tree rows in each direction are planted up in lines at right angles to the tree row, whereas the spaces remaining in the centre are planted in groups on the square. Thus cultivation in both directions is possible, while full use is made of the available land.

3249. Bargioni, G.
Contributo allo studio del sistema radicale del ciliegio nel Veronese. **(A study of cherry root systems in the Verona district.)** [English summary 9 lines.]
Riv. Ortoflorofruttic. ital., 1959, **43**: 99-119, bibl. 33, illus.

Observations are made on the excavation of a Mora di Cazzano cherry tree worked 35 years previously on *Prunus avium* and growing among vines and other cherries. The land between the rows was normally cultivated and sown with green crops which themselves received manuring. Originally the heavy soil had been deeply worked only along the lines in which the vines and cherries were planted. The evidence shows that the roots spread very much further laterally than the tops, that 80–90% of them remained (a) in the top 50–60 cm. of soil and (b) in the original deeply worked area, that there were numerous large roots which had suffered appreciable damage from the cultural operations given to the green crops, and that the soil below 50 cm. was extremely poor. Suggestions are made for changing future cultivation practice by specialization of culture, by more thorough working of all the soil before planting, and by the possible use of irrigation.

3250. Watanabe, T., and Shigeta, T.
Soil management in peach orchards. [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 15-22, illus.

In the experiment described here clean weeding, mulch, a grass cover and inter-cropping were compared over several years in an orchard containing 2 peach varieties growing in loam. Clean weeding resulted in adequate soil structure, tree growth and fruit quality, and retained soil moisture well during the dry season. Mulch increased soil fertility but reduced yield and quality and retained excess water in the rainy season; there was also a greater incidence of peach resin disease [? gummosis]. The grass cover allowed adequate moisture retention, but tree growth, fruit yield and quality became markedly dependent on fertilizers, especially N. Inter-cropping led to a high N status in the soil, resulting in vigorous shoot growth but low yields from the young trees. Clean weeding is recommended.

Nutrition and mineral composition of trees.

(*See also* 3168, 3308m, y, 3309e, 3383, 3384.)

3251. Shibukawa, J., and others.
Studies on the foliar nutrition of apple trees. Foliar sprays of phosphate, potassium and a fertilizer containing nitrogen, phosphorus and potassium. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1959, **28**: 1-11, bibl. 18, illus.

P and K were absorbed by apple leaves from a 0·5% mono-ammonium phosphate solution and from a 0·5–1·6% potassium sulphate solution. Absorption of N and P from the spray began about 5 hours after application, and absorption of K about 10 hours after application. Application of the complete fertilizer from mid-May to late August increased the growth of young apple trees, and invigorated poorly-growing apple trees suffering from root rot (*Rosellinia necatrix* and *Helicobasidium mompa*) or K deficiency. The complete fertilizer was best applied at a rate of 0·2–0·4%. The addition of lime sulphur to the complete nutrient spray caused leaf scorch, but no scorching followed the addition of bordeaux or of lime sulphur plus ferric sulphate.

3252. Gruppe, W.
Untersuchungen über das Wachstum junger Apfelbäume bei verschiedenen K/Mg-Verhältnissen und über die zeitliche Aufnahme und Verteilung der Makronährstoffe. **(Studies on the growth of young apple trees under different K/Mg conditions and on the time of uptake and distribution of the macronutrients.)**
Gartenbauwiss., 1958, **23**: 363-85, bibl. 22, illus.

Maiden trees of Cox's Orange on A.2, both of which show symptoms of Mg deficiency very easily, were grown in quartz sand for 30–120 days with varying ratios of K and Mg. These ranged from 0K/8Mg to 8K/0Mg. The optimum ratio in respect of formation of dry matter, uptake of nutrients and growth of different parts of the plant appeared to be 3–3·5K/5–4·5Mg. With a decrease in K and an increase in Mg supply a relative promotion of the growth of roots and stems occurred, but with the opposite treatment leaf development was promoted, although the Mg-deficient leaves dropped continuously. The best utilization of N (13·8 mg. N absorbed per g. of dry matter formed) occurred at 6K/2Mg. The response of the plants to different levels of K and Mg supply is recorded in detail.—Inst. Obstb. Baumsch., Sarstedt-Hannover.

3253. de Haas, P.-G.
Mineralstoffversorgung und Fruchtqualität beim Apfel. **(The supply of mineral nutrients in relation to fruit quality in apples.)**
ErwObstb., 1959, **1**: 14-19, bibl. 25.

Of all the nutrients tested, N and K had the most pronounced influence on fruit quality and storage life of apples, though always in relation to fruit set. In the case of poor fruit set, a high level of N manuring produced large fruits which were of low quality and did not store well, while in the case of a full fruit set the same amount of N was usually associated with very good fruit quality and storage capacity. Severe pruning increased the effect of

N and K. No direct relationship between Mg supply and fruit quality has been established, but an adequate level of Mg was found to be necessary for the full effect of K to be felt. Ca and P had no consistent effects on fruit quality. In some areas B deficiency was an important factor reducing the saleability of the fruit. Some practical consequences of these findings are discussed.—Inst. Obstb. Baumsch., Sarstedt-Hannover.

3254. Collins, W. B., and White, R. G.
Apple nutrition studies.
Progr. Rep. exp. Fm Fredericton, N.B., 1953-1957, 1959, pp. 23-4.

The outstanding result from trials held at Fredericton and in growers' orchards is the effect of the ratio N to K in the tree on fruit colour, size and keeping quality. They show that the optimum N/K ratio for colour and size is between 1·13 and 1·25, while that for keeping quality is a little higher. A ratio of 1·25, which has been determined as about correct for McIntosh in Ontario, would probably also fit in with New Brunswick conditions.

3255. Eggert, F. P., Murphy, E. F., and Johnson, R. A.
The effect of level of foliage nitrogen on the eating quality of McIntosh apples.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 46-51, bibl. 7.

McIntosh apples from trees at 2 N levels (1·90 and 2·50% N in leaves) were evaluated for flavor and texture in October, December and January. The results showed that at each date both red- and green-skinned apples from high-N trees were significantly preferred for both flavor and texture to red-skinned apples from low-N trees. In October and December (but not in January) the flavor of red-skinned high-N apples was significantly preferred to that of green-skinned apples from the same trees. At no testing date was there a texture difference between red- and green-skinned apples from high-N trees. Pressure tests, soluble solids, total acidity, and soluble solids/acidity ratios seemed in no way to be related to the palatability findings. [Authors' summary.]—Univ. Maine, Orono.

3256. Askew, H. O., Watson, J., and Chittenden, E. T.
Mineral and nitrogen content of Cox's Orange apples in relation to incidence of bitter pit.
A. R. Cawthron Inst. 1957-58, 1958, pp. 35-7.

The course of mineral and N accumulation in young developing fruits and older leaves was studied during one season's growth, but has not yet been related to the incidence of bitter pit. The effect of foliar applications of metal acetates and calcium phosphate on fruit and leaf composition was also observed. Observations on the incidence of bitter pit in stored fruit showed that Ca sprays appeared to be beneficial.

3257. Hibbard, A. D., and Mohsen Nour.
Leaf content of phosphorus and potassium under moisture stress.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 33-9, bibl. 18.

Pot experiments were conducted with apple and peach trees, strawberry runners and mustard to investigate the effect of moisture stress on the uptake of P and K. The moisture levels tested were 70, 40 and 10% of the total available moisture-holding capacity of the soil. The effect of increasing the availability of P and K in the soil under the same moisture conditions was also studied. Regardless of the K content of the soil, there was a reduction in leaf concentration of K with increased moisture stress. The minimum moisture level had an effect on the K content of the leaves which was as great as that due to the K supply in the soil. Under drought conditions leaf concentrations of K fell to critical levels without any evidence of wilting or deficiency symptoms. Leaf concentrations of P were more affected by soil moisture stress than by the available supply of P in the soil. The total uptake of both elements was much greater at the higher moisture levels because of the greater dry weight attained. It is concluded that leaf samples taken from plants which have been under moisture stress may show low K and P contents which cannot be correlated with the available soil supply of these elements.—Univ. Mo, Columbia, and Middle Rio Grande Exp. Stat., Albuquerque, N. Mexico.

3258. Shibukawa, J., and others.
Studies on leaf analyses of apple trees. I. A leaf analysis survey of apple orchards (6).
[Japanese, with English summary 1 p.]
Misc. Publ. Aomori Apple Exp. Stat. **12**, 1958, pp. 7.

From a survey made in 1957 involving 1,473 leaf samples of Ralls, Jonathan and Delicious apple trees in 753 orchards, the range of NPK contents is tabulated under varieties. No correlations were found between the mineral content of the leaf and tree age or previous fertilizer treatment, but the K content was lowest in trees grown on alluvial soils. The critical limits for N, P and K in the leaves of these varieties in the Aomori district in 1957 are presented. [For Parts 4 and 5 see *H.A.*, 28: 3339.]

3259. Bussmann, A., and Gerber, H.
Untersuchungen über die Wahl der Bezugsgrösse bei der Pflanzenanalyse, im besondern bei der Bestimmung der jahreszeitlichen Nährstoffschwankungen in Apfel- und Birnblättern. **(Studies on the choice of the basic value in plant analysis, with special reference to determination of seasonal variations in the nutrient content of apple and pear leaves.)** [French and English summaries 14 and 12 lines.]
Landw. Jb. Schweiz, 1959, **8**: 21-33, bibl. 15.

The seasonal variations in the nutrient content (P, N, K, Ca, Mg and Fe) of leaves of several apple and pear varieties were studied. The results of these analyses were related to the following basic values: Dry matter (DM); fresh weight (FW); leaf surface (LS); crude fibre (CF); ash; nitrogen (N). The variations of nutrient content depended to a great extent on the basic value used. Percentage deviations from the maximum value (=100%) were calculated for each basic value and nutrient. The average of these figures was taken as the content of P, N, etc., at a given moment. Deviations from this average value increased in the following order: DM, FW, CF, ash, N, LS. Both DM and FW are suitable as a basic value, but for practical reasons DM is to be preferred. [From authors' summary.]—Wädenswil.

3260. FISHER, E. G., AND OTHERS.
The influence of phosphorus, potassium, mulch, and soil drainage on fruit size, yield, and firmness of the Bartlett pear and on development of the fire blight disease.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 78-90, bibl. 4.

In one orchard K applications increased fruit size and increased the K content of mid-summer leaf samples from 0·7 to above 1·0%; fruit yield was only increased by K in 1 out of 4 years. No effect was noted in 3 other orchards where the average K level of minus-K trees was at or above 0·96%. In the orchard which responded to K application mulching increased leaf K, fruit size and yield, and branch diameter. P applications increased yields in 1 out of 4 years in 2 out of 4 orchards (i.e. those with the lowest levels of leaf P when untreated). Leaf N was increased by P applications in the orchard showing the lowest P levels. P also increased branch diameter. Straw mulching increased development of fire blight. Fire blight infection was greatest in the areas of poorest soil drainage. P and K treatments had no measurable effect on fire blight development.—Cornell Univ., Ithaca, N.Y.

3261. DELMAS, J., BATS, J., AND MARENAUD, C.
Étude sur le rôle du phosphore dans la nutrition des pêchers en solution nutritive. **(Phosphorus nutrition of peach trees in nutrient solution.)**
Ann. agron., 1958 (issued 1959), **9**: 334-5.

In a continuation of trials at Pont-de-la-Maye [see *H.A.*, 28: 2203], some of the trees were removed from the culture solution and planted in pots containing soil and 0, 100 or 400 g. P. The same tendencies as before were noticeable, both in the solution and in soil, though in soil the differences were somewhat less marked. The conclusion is reached that lack of P is shown in every aspect of growth of peach trees, and that overmanuring with P can lead to disorders which are not at present well defined.

3262. DELMAS, J., AND MARENAUD, C.
Observations sur la nutrition phosphatée de la vigne et du prunier en solution nutritive. **(Phosphorus nutrition of vines and plum trees in nutrient solution.)**
Ann. agron., 1958 (issued 1959), **9**: 333.

P requirements of plum trees appear to resemble those of peaches. Thus 1 p.p.m. and 2 p.p.m. increased growth considerably, but 20 p.p.m. resulted in no increase in height and only a slight one in girth, while 50 p.p.m. resulted in less growth than 5 p.p.m. Vines on the other hand benefited considerably from P applications up to 20 p.p.m., but not from 50 p.p.m.—Pont-de-la-Maye.

Pollination and pollen.

(*See also* 3178, 3309w, 4014.)

3263. CANISIUS, J. J., AND WOUDENBERG, A. J.
Waarnemingen over bestuiving. **(Observations on pollination.)**
Fruitteelt, 1959, **49**: 603.

In a block of 10-year-old Jonathan trees, those on the outside, nearest to an orchard of Cox and Lombart's Calville, gave the highest yields. An increase of 40 m. in distance from the pollen source resulted in a reduction of about 80% in yield. In another block, of young Cox trees, yields dropped by about 50% as the distance from the pollen source increased to 18 m.

3264. BREVIGLIERI, N.
Ricerche sull'impollinazione del melo e del pero. L'ape è il pronubo insostituibile. **(Investigations on the pollination of apples and pears. The bee is an indispensable agent.)**
Riv. Ortoflorofruttic. ital., 1958, **42**: 588-98, illus. [French edition in *Congrès pomol., 89me Session 1958*, 1959, pp. 135-43.]

Whereas previous workers have doubted the value of bees for the pollination of Delicious apple trees, the author found that an appreciable number of nectar-collecting bees which visit Delicious flowers do settle on the anthers and stigmas and hence appreciably facilitate pollination in that variety. Secondly, he demonstrated that many of the worker, pollen-collecting bees contribute considerably to cross pollination, having previously visited other apple varieties. In a trial involving syrups of various colours, those preferred by bees, in descending order of preference, were white, creamy white, bright blue, orange, pea green, green, dark orange tending to red and dark red. As regards scents, bees came most often to syrups treated with essence of mint, followed by pine, rather less to those treated with bergamot or lavender essence, and last to those with synthetic rose essence. A list of cross-pollinators is given for 21 apple varieties.

3265. Stephen, W. P.
Pear pollination studies in Oregon.
Tech. Bull. Ore. agric. Exp. Stat. **43**, 1958, pp. 43, bibl. 28, illus.

Observations made in 15 locations on 4 pear varieties during the years 1954–57 are summarized and evaluated. Self-pollination was found to produce seedless fruit in Anjou, Bosc and Comice, but both seeded and seedless fruit in Bartlett [Williams']. There were no significant differences in size and shape of fruit from selfed and crossed florets, nor any differences in flavour, sugar content and texture between seeded and seedless fruits. Prevention of cross-pollination in Anjou for 3 years resulted in a 92% decline in yield. Mustard and plum were the principal pollen competitors, and a direct correlation was established between the bee populations in the trees and the total yield. While the florets were found to be pollen receptive for 19 days or more, adequate cross-pollination of a tree required less than a single day with conditions good for bee flying. Considerable quantities of pear pollen were also windborne. While 30·8% of cross-pollinated florets produced mature fruits, only 8·2% of the selfings did so. One colony of bees per acre should be adequate to ensure cross-pollination except where local competition with other plants is very high.

3266. Draczynski, M.
Der zeitliche Verlauf der Pollendifferenzierung bei Mandel, Pfirsich und Aprikose und der Einfluss der Knospentemperaturen auf diese Vorgänge. **(The course of pollen differentiation in almond, peach and apricot and the effect of bud temperatures on these processes.)**
Gartenbauwiss., 1958, **23**: 327-41, bibl. 11.

Early flowering almond varieties, in certain parts of Germany, complete pollen differentiation in the year preceding flowering. The 75 peach varieties examined may be divided into 4 groups ranging from those completing pollen differentiation in the previous year to those completing it at the end of March. The 28 apricot varieties examined may be divided into 3 groups, group 1 showing archespore formation during the first 10 days of December, group 2 at the end of December and group 3 at the beginning of February. Thermo-electrical measurements of bud temperatures confirmed that direct solar radiation accelerates the process of pollen differentiation, especially in peaches and apricots, even though the air temperature may be low.—Hess. Lehr- u. ForschAnst. Geisenheim am Rhein.

3267. Maškin, S. I.
The use of heteroauxin as a stimulant of pollen germination and pollen tube growth in some fruit plants. [Russian.]
Fiziol. Rast., 1959, **6**: 370-2, bibl. 11.

The pollen of varieties of *Prunus cerasus*, *P. besseyi*, *Malus domestica*, *Pyrus communis* var. *sativa*, and *Cydonia vulgaris* and a mixture of apple, pear and quince pollen were used in experiments to determine the effect of heteroauxin on germination and tube growth. Cultured on a 7·5% glucose solution the percentage of pollen germination was much higher and the length of pollen tubes was greater when potassium indolylacetate at 1 : 50,000 concentration was added than when a higher concentration (1 : 10,000) was used or no stimulant applied. Mountain ash cross-pollinated with a mixture of apple, pear and quince pollen did not set fruit, but pollination of 285 flowers with the mixture, followed immediately by dusting with 6 mg. of heteroauxin in 1 g. of talc, gave rise to 10 ripe fruits out of which 20 hybrid seeds were extracted.

Pruning, training and defoliation.

(*See also* 3230, 3310c.)

3268. Miller, V. J.
Crotch influence on strength and breaking point of apple tree branches.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 27-32, bibl. 17.

Apple branches on 10-year-old trees were broken with a beam designed to approximate the natural weight on the branch base and crotch, to determine the effect of crotch angle on branch strength. The percentage of branches breaking at the crotch increased as the crotch angle decreased. Narrow angled branches broke at somewhat lower breaking stress values than wider angled branches. Narrow angled branches were larger than wide angled branches. The faster growth of such branches was apparently responsible for their lower breaking stress. Narrow crotch angles did not cause a decrease in branch strength. Branches with narrow crotch angles do not break under less stress than branches with wide crotch angles if their size relative to the trunk is the same. [Author's summary.]—Univ. Neb., Lincoln.

3269. Uitterlinden, L.
De snoei van het vruchthout op jonge nog sterk groeiende vruchtbomen en de vruchtzetting. **(Pruning fruiting wood on young, actively-growing trees, and fruit setting.)**
Fruitteelt, 1959, **49**: 320-1, illus.

When 2-year-old shoots of young apple trees were pruned, fruit set was improved in 1956; in 1957, however, there was little difference in fruit set on pruned and non-pruned twigs. Fruit set of pears in 1956 was improved by shortening some of the

2-year-old wood. When all the 2-year-old wood was shortened, however, fruit set was reduced on Bonne Louise d'Avranches and Comtesse de Paris, but increased on Conference.—R.T.C., Barendrecht.

3270. Schulz, F.
Der Einfluss des Schnittes auf den Schattenmorellenertrag im Verlauf von rd. zwei Jahrzehnten. (**The effect of pruning on fruit yields of Morello cherries in the course of about two decades.**)
ErwObstb., 1959, **1**: 32-4, illus.

Spur pruning proved to be quite uneconomical in comparison with no pruning. With the change-over to another treatment, viz. the cutting out of individual shoots and of old wood, pruned trees out-yielded the controls. Over the whole period no pruning, in conjunction with proper disease and pest control, manuring and irrigation, sufficed to achieve an average yield of 36·8 kg./25 sq. m. or of 14,700 kg./ha. (400 trees).—Inst. Obstb. tech. Univ. Berlin.

3271. Rakitin, Ju. V., and Imamaliev, A.
Physiological changes in fruit trees during chemical defoliation. [Russian, with English summary ⅓ p.]
Fiziol. Rast., 1959, **6**: 197-201, bibl. 8.

A 0·25% solution of magnesium chlorate hexahydrate and a 0·075% solution of endothal successfully defoliated 1- to 3-year-old apple trees 12–15 days after their application in late August or early September. Changes noted in the metabolism of the treated leaves were loss of chlorophyll, cessation of photosynthesis, increase in the activity of oxidizing and flavin enzymes, reduction in the activity of Fe- and Cu-containing enzymes, stimulation of respiration and of hydrolysis of starch and organic phosphorus compounds and intensification of translocation.

Fruit thinning and drop.

(*See also* 3308u, 3309i, z.)

3272. (Harley, C. P., Moon, H. H., and Regeimbal, L. O.)
Apples every year—through hormones.
Agric. Res. Wash., 1959, **7**(9): 3, illus.

Naphthaleneacetic acid and naphthylacetamide have been shown directly to influence blossom bud induction beyond what would be expected from on-year thinning. Weak sprays of 2, 5 and 10 p.p.m. NAA applied to York Imperial trees had little thinning effect, but caused 16·6–25·5% of the growing points to flower in the succeeding off-year, compared with 2·3% for the control. Defoliation in the off-year to 2 or 3 leaves per spur greatly reduced the percentage of growing points initiating blossom buds in the following on-year. However, when similar defoliation was preceded by an NAA spray, applied at 10 p.p.m. 21 days after full bloom, a marked increase occurred in the percentage of growing points flowering the following season.

3273. Bömeke, H., and Bohling, H.
Der augenblickliche Stand der chemischen und mechanischen Ausdünnung der Blüte und des Fruchtansatzes. (**Our present knowledge in the field of chemical and mechanical flower and fruit thinning.**)
Mitt. ObstVersuchsringes Jork, 1959, **14**: 93-9, bibl. 4, illus.

Chemical thinning followed by hand thinning is advocated as a result of experiments carried out on apples and pears at different dates and temperatures. Shellestone and the amide of NAA were used as sprays.

3274. Säkö, J.
Omenien putoamisen vähentämisestä ennen sadonkorjuuta ja sen aikana. (**Preharvest and harvest drop of apples.**) [English summary ¾ p.]
Maataloust. Aikakausk., 1959, **31**: 81-9, bibl. 12.

Applications of 80 p.p.m. 2,4,5-TP about 21–33 days before harvest effectively reduced preharvest and harvest drop in 7 apple varieties. At 20 p.p.m. results were less effective. The effect of 2,4,5-TP was increased by adding 0·125% or 0·25% Tween when applied to Wealthy and Antonovka, but there was no marked effect with Åkerö. The fruit colour of all varieties was improved by 2,4,5-TP sprays.—Dep. Hort., Piikkiö, Finland.

3275. Alderman, D. C., and Gripp, R.
Pears. Chemical thinning.
Amer. Fruit Gr, 1959, **79**(3): 22-3.

Amid-thin (NAA) was applied at 3 concentrations to Bartlett pears about 2½ weeks after full bloom. At 25 p.p.m. fruit set was 1⅓ fruits per spur, compared with almost 2 on non-sprayed trees. Yields were reduced as hormone concentrations increased, but fruits from sprayed trees were slightly larger than those from control trees.—Univ. Calif., Davis.

3276. Hill, R. G., Jr.
Chemicals aid other practices in peach thinning.
Ohio Fm Home Res., 1958, **43**: 84-5, illus.

Results from 3 seasons' experiments show that NPA [naphthylphthalamic acid] is an effective thinning agent when applied 3–5 days after full bloom at a concentration of 250–275 p.p.m. The variety Halehaven has been used mostly in these tests, but there are indications that NPA is equally effective for other varieties.

3277. Thompson, A. H.
Stone fruits. Spray thinning of peaches.
Amer. Fruit Gr, 1959, **79**(3): 36-40.

Results with naphthylphthalamic acid (NPA) for peach thinning are reviewed. NPA is applied 3–5 days after full bloom, at concentrations related to the varietal ability to set fruit; the number of gallons applied per tree is important. The spray should not be applied at temperatures below about 50° F.

3278. Thompson, A. H., and Rogers, B. L.
Three years' results with new chemicals for thinning of peaches after the blossoming period.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 112-19, bibl. 7.

Twenty-five chemicals were screened in an attempt to find one that would thin peaches safely when applied after the frost period is usually over in Maryland, i.e., one month after full bloom. Both 2- and 3-chlorophenoxy alpha propionic acids (2 CP and 3 CP) are considered worthy of further trial. More latitude in timing is possible with these chemicals than with NPA. Optimum concentrations will depend on variety and environmental conditions. The most promising concentration range for 2 CP in the mid-Atlantic region appeared to be 150 to 300 p.p.m., and for 3 CP, 50 to 200 p.p.m.—Univ. Md., College Park.

Fruit development, composition and maturity.

(*See also* 3167, 3308q, 3310d.)

3279. Stenz, S.
Die Grössenveränderung der Früchte von zwei Apfelsorten (Borkh) im Zusammenhang mit meteorologischen Umweltbedingungen. **(Changes in the size of the fruits of two apple varieties in relation to meteorological conditions.)**
Schweiz. Z. Obst- u. Weinb., 1959, **68**: 267-70, 285, 288-90, illus.

Two years' records, using apparatus which is described, emphasize the importance of high relative humidity in relation to the development of fruit trees in general and to the size of apple fruits in particular.—Inst. Agrarmeteor., Karl-Marx-Univ., Leipzig.

3280. Kertesz, Z. I., Eucare, M., and Fox, G.
Apple cellulose.
Food Res., 1959, **24**: 14-19, bibl. 10, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-332.

The firmness and cellulose content of the flesh of 17 varieties of apple were determined in fruit freshly picked for commercial storage, and after storage for 102–135 days. The average cellulose content before storage was 0·438% and after storage 0·431%. Cellulose concentration is a factor in apple firmness at the time of picking, but changes in the amount or quality of the cellulose are not involved in the softening which occurs during storage.

3281. Foury, M. R., and Foury, C.
Remarques sur la croissance et la maturité de deux variétés de poires d'été dans la basse vallée du Rhône. **(Notes on growth and maturation of two varieties of summer pear in the lower Rhône valley.)**
Pomol. franç., 1959, No. 2, pp. 3-10, illus., No. 3, pp. 11-16, and No. 4, pp. 12-15.

In the pre-maturity stages of fruit development of Dr. Jules and Williams' the rate of fruit growth seemed to be independent of its size. There was an increasing divergence (with time) between the estimated and actual curves for fruit development from small to large fruits, which suggests that large fruits are more sensitive to climatic conditions. Significant positive correlations were shown between fruit weight and diameter with both varieties. With a late harvest the total weight of harvested fruits was increased, and the number of large fruits was also increased. Late-harvested fruits lost the least weight during storage. Economically the worst period for marketing is at the start of the normal harvesting time, but an early harvest eliminates one insecticidal application. Late picking, although it improves fruit quantity and quality, is difficult on a large scale in practice. It is concluded that further work on the effects of climate, irrigation and late manuring is required.

3282. Bradley, M. V.
Mean cell size in the mesocarp of mature peaches of different sizes.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 120-4, bibl. 11.

A tendency toward greater mean cell size in large than in small fruits was found, but exceptions occurred. Analysis of the data showed that cell size was positively correlated with flesh thickness and cheek diameter. However, cell size was apparently not the chief determining factor in fruit size at maturity. [From author's summary.]—Univ. Calif., Davis.

3283. Reeve, R. M.
Histological and histochemical changes in developing and ripening peaches. I. The catechol tannins.
Amer. J. Bot., 1959, **46**: 210-17, bibl. 37, illus.

Selective histochemical tests for catechol derivatives revealed marked changes in tannin contents during the development and ripening of peaches. Increases in catechol derivatives were associated with early maturation and lignification of the endocarp sclereids and particularly with cessation of cell divisions and early cell enlargement of the mesocarp parenchyma. Characteristic progressive localizations of tannins in patches of enlarging mesocarp parenchyma cells were observed in green fruits approaching maturity. The insoluble tannin colour complexes produced by these tests remained coarsely granular and intense in green fruit. Upon ripening of the fruit, colour intensity produced by the nitroso reaction decreased and the insoluble tannin complexes were more finely divided. The association of phenols with cellular differentiation, lignification and suberization are briefly discussed. [From author's abstract.]—W. reg. Res. Lab., U.S.D.A., Albany, Calif.

3284. Reeve, R. M.
Histological and histochemical changes in developing and ripening peaches. II. The cell walls and pectins.
Amer. J. Bot., 1959, **46**: 241-8, bibl. 24, illus.

Histological and histochemical observations on developing and ripening clingstone and freestone peaches have revealed that, after cell divisions have ceased in the mesocarp, cell wall thickening and cell enlargement in the mesocarp parenchyma increase until the fruit is nearly full cell size. The cell walls then decrease in thickness as the fruit ripens and softens. Degree of methyl esterification of the pectic substances, as estimated histochemically, remains at about 75–80% in immature fruits during their cell-enlargement phase of growth. Per cent of methyl esterification apparently is much lower, or amounts of esterified pectates are very low, during the meristematic phases of fruit growth. Just prior to ripening, degree of esterification increases and approaches 100% in hard, ripe fruit at about the same time that the parenchyma cell walls exhibit their greatest thickness or degree of hydration. The degree of esterification of the pectic substances then rapidly decreases and the cells walls become appreciably thinner as the ripening fruit softens. Further relation of these changes in wall thickness, in degree of esterification of the pectins, and in other cell wall carbohydrates to the textural qualities of ripening fruits is discussed. Interpretations concerning cell wall plasticity, cell growth and relation between auxin and changes in pectins also are presented. [Author's abstract.]—W. reg. Res. Lab., U.S.D.A., Albany, Calif.

3285. Birth, G. S., and Norris, K. H.
Instrument using light transmittance for non-destructive measurement of fruit maturity.

Ernest, J. V., and others.
Evaluation of light transmittance techniques for maturity measurements of two varieties of prune-type plums.
Food Technol., 1958, **12**: 592-5 and 595-9, bibl. 14, from abstrs in *J. Sci. Food Agric.*, 1959, **10**: i-276-7.

(Birth, G. S., and Norris, K. H.)
The Hortispect—an instrument to measure fruit maturity.
Agric. Mktg, 1959, **4**(4): 7, illus.

U. S. Dep. Agric., Biological Sciences Branch.
Quality inspection development.
Apple Res. Dig. Yakima, 1959, No. 148, pp. 3-4, illus.

Accounts are given of the operation and performance of a spectrophotometer, called the "Hortispect", designed to measure internal flesh colour changes in intact fruit by the wavelength of peak light transmittance passing through the fruit. Results are recorded of measurements made with this instrument on the prune-type plums, Italian prune and Stanley, either maturing on the tree or ripening in storage. Wavelength of peak transmittance was correlated highly with (a) loss in firmness as measured by shear resistance, (b) Hunter "a" readings, and (c) the soluble solids/acid ratio of freshly harvested fruit. Accuracy was evaluated by comparison with previously used indices. In addition to measuring maturity, the instrument might be used to detect such factors as water core and internal breakdown of apples.

Harvesting, transport and storage.

(*See also* 3168, 3265, 3281, 3308b, c, i, k, z, 3309b, k, n, r, t, 3310a, 3723j, 4139.)

3286. Gorini, F. L.
La vitrescenza delle mele. (**Water core in apples.**)
Frutticoltura, 1959, **21**: 281-6, bibl. 15, illus.

The author discusses the various hypotheses explaining the phenomenon of water core. He concludes that, although no specific direct remedy can be recommended, early picking is advisable in susceptible varieties. Further, picking should be expedited if the phenomenon becomes at all noticeable on the tree. Or, to put it in another way, it should be helpful to pick the fruit when it is rather less ripe than usual in years when September and October are hot and bright or when the smallness in number and large size of fruit suggest high starch and sugar contents.

3287. Eaton, S. C., and others.
Harvesting and handling methods.
A.R. N. Scotia Fruit Grs' Ass. 1958, pp. 65-71.

Contributions to this Symposium on apple harvesting include: Supervision of picking crew, by S. C. Eaton; Spot picking McIntosh, by O. DeWolfe; Availability of pickers, by L. S. Johnson; Grading on intake [before storage], by H. N. Cohoon; Piece work and bruise control, by F. Killam.

3288. Gilbert, C.
Our experience with bulk bins.
Proc. Wash. St. hort. Ass. 1958, p. 63.

The author points out the difficulty presented by low clearance in the orchard, the desirability of building bins to fit the storehouse available, the value of protecting bins with liners, possibly paraffin-impregnated cardboard, and the probable usefulness of a jeep-operated straddle trailer for hauling operations.

3289. ANON.
Adaptation of bin boxes for handling fruit.
Apple Res. Dig. Yakima, 1959, No. 147, pp. 4, illus.

The results of recent research into the design of pallet bins for bulk handling apples are described. Fruit in large bins, 8 ft. long and provided with end-gates, was dumped with less damage than by any other method. Adequate cooling was achieved in boxes vented on 8–10% of the surface. Bins lifted by the sides (with the prongs of the fork-lift set on edge) were easy to fill and made for more effective use of storage space, especially where ceiling heights were low. In bruising tests handling in pallet bins proved much better than handling in single boxes on pallets, but the latter stored a little better. In trials of dumping methods the most gentle was water submersion dumping in which the bin is immersed and the fruit floats out. The next most gentle was a commercial tilting-type dumper.

3290. MCBIRNEY, S. W.
Use of pallet bins for the 1958 apple harvest in Washington.
Proc. Wash. St. hort. Ass. 1958, pp. 163-5.

After discussing bins and bin-emptying equipment, their adaptation and costs, the author turns to a consideration of reasons for the changeover from boxes to bins. The major reason in his opinion is that bin harvesting saves money without decreasing quality of fruit. A contributory factor is that the industry has suddenly changed from boxes to fibre cartons as shipping containers because of market preference, and it therefore no longer has boxes available for picking purposes. The large saving in picker-container costs achieved by the use of bins has been clearly demonstrated. The possibility of saving in cold-storage space, improved fruit quality, reducing picking time and rapid movement of fruit from orchard to plant are contributing to the speed of adoption of bin harvesting.

3291. ORMISTON, O.
Apple handling in bins.
MATSON, J.
Bulk bins.
Proc. Wash. St. hort. Ass., 1958, p. 64 and p. 65.

Ormiston is trying out and discusses sizes and weights of bin. Matson finds his apple harvesting costs greatly lightened by the use of bulk bins. He points out, however, that the benefits of the system may be limited by having to pick from scattered trees, by having to use outmoded stores and by the facts that pickers still persist in bruising fruit, tractor drivers still drive too fast and fruit cooling in the orchard is not aided by the process. Nevertheless, the opportunity for rough handling is diminished.

3292. PATCHEN, G. O.
Cooling of apples in bulk bins.
Proc. Wash. St. hort. Ass., 1958, pp. 61-2, bibl. 3.

The author considers the greater difficulty in cooling presented by the bulk handling system. He concludes that four points should be considered for adequate cooling of apples in pallet boxes [bulk bins]: (1) Provide at least 8–11% of ventilation in either the side or bottom. (2) Stack with rows parallel to the air flow. (3) Keep approx. 4–6 in. of free air space between rows. (4) Leave at least a 6-in. air space along all walls.

3293. WALKER, W. F.
Shipping apples in bulk containers.
Tasm. J. Agric., 1959, **30**: 5-12, illus.

In trial shipments from Tasmania to London of Cleopatra, Jonathan and Sturmer apples in a newly designed container there was practically no bruising, whereas in standard apple boxes 9–51% of the apples were bruised. The containers are large crates lined inside with hardboard and strengthened with metal corners, holding approximately ½ ton of fruit.

3294. PIERSON, C. F.
Fungicides for reduction of post-harvest decay of sweet cherries.
Proc. Wash. St. hort. Ass. 1958, pp. 115-16, bibl. 7.

Bing cherries, some artificially inoculated with various rot fungi and some not so inoculated, were treated with captan 0·125% and phaltan 0·125% by immersion. Decay was appreciably reduced by both substances in all cases. Large scale trials are contemplated.

3295. ANON.
Bulk handling of cling peaches.
West. Fruit Gr, 1959, **13**(6): 25-8, illus.

Recent experience in bulk harvesting and grading cling peaches in California is discussed. Bulk handling of freestones also appears to be practicable but is not yet being practised. In general, bulk handling has reduced costs and bruising, although the latter requires further attention. Grading at the loading station has proved advantageous. Pickers have favoured bulk handling. Two methods of bulk bin dumping have been tested, and certain growers have used bulk trailers rather than bins. Hydrocooling and top icing have proved beneficial.

3296. FRAPPELL, B. D.
Harvesting and storage of pears.
Tasm. J. Agric., 1959, **30**: 17-22, bibl. 6, illus.

The harvesting of pears at optimum maturity is discussed, together with the possible effects of delays between picking and cold storage. An account is given of the investigations conducted during the 1958 season, when results indicated that Winter Coles harvested during the last week of March would permit sufficient time before ripening for discharge and marketing on overseas markets, while those harvested three weeks later in the middle of April softened and ripened too rapidly for satisfactory marketing. [Author's summary.]

3297. Mattus, G. E., Scott, L. E., and Claypool, L. L.
Brown spot of Bartlett pears.
Calif. Agric., 1959, **13**(7): 8, 13, illus.

Brown spot on pears followed impact bruising of firm fruit, most of which occurred during grading and sizing at the packing-house or cannery. Suggestions are made for modifications of handling to reduce losses from brown spot.—Univ. Calif., Davis.

3298. Säkö, J.
Omenien varastoimisesta. Varastoimiskokeet puutarhantutkimuslaitoksella piikkiössä vuosina 1954-58. **(On the storage of apples. Experiments at the Department of Horticulture 1954-58.)** [English summary $\frac{3}{4}$ p.]
Publ. Finn. St. agric. Res. Bd **173**, 1959, pp. 25.

Refrigerated and ventilated storage showed little difference, since the temperature of the latter soon dropped to 2–4° C. In these trials 9 apple varieties maintained their keeping quality about equally well until the beginning of December. Later, physiological disorders and rots set in to various degrees. The Canadian variety Lobo had a particularly long storage life, Wealthy and Åkerö being runners up. Polythene bags reduced storage losses considerably during the first 8–10 weeks, but thereafter they increased the liability to spoilage.

3299. Melville, F.
The storage of the Granny Smith apple.
J. Agric. W. Aust., 1959, **8**: 91-5.

Granny Smith apples grown in Western Australia are now being asked for in Singapore, the U.K. and Scandinavia, and this variety now forms nearly 50% of new plantings. Storage trials started in 1950 lead to the following main recommendations. Harvest at the right stage for fruits destined for long storage or export and not too early. Place in cool store without delay, excluding all sunburn-affected fruits. Use oil wraps for all stored fruit except that harvested late or only destined for short storage. To avoid scald, hold first at 38°–40° F. for 1–1$\frac{1}{2}$ months and then at 32° F. The author also notes the potential value of impregnating the wraps with diphenylamine. This substance has not yet been released for commercial use in W.A.

3300. Eaves, C. A.
Dry scrubber for the removal of carbon dioxide from controlled atmosphere storage for apples.
A.R. N. Scotia Fruit Grs' Ass. 1958, pp. 105-6.

A dry scrubber, developed at Kentville, N.S., is described and illustrated diagrammatically. The action of the scrubber depends on the absorptive capacity of fresh hydrated lime for CO_2. If the storage atmosphere is allowed to diffuse into an insulated gas-tight container filled with lime, a steady concentration of 0·8% CO_2 can be maintained in the store. By controlling the rate of diffusion with gate valves, it is possible to regulate the concentrations of CO_2 and O_2. When lime reacts with CO_2 water is released and heat is absorbed, and so storage humidity is maintained at a relatively high level and temperatures are reduced. The lime is effective in unopened bags, and 2–3 lb. are required per bushel of fruit. The dry scrubber costs $200.00, compared with $500.00 for the conventional sodium hydroxide scrubber, and maintenance costs are considerably lower. Labour of replacing the caustic solution daily is eliminated, no corrosion of equipment occurs, and there is no need for pumps and fans. Quality of fruit stored in the two types of scrubber appeared to be similar. [For a preliminary account see *H.A.*, 28: 166.]

3301. Hardenburg, R. E., and Anderson, R. E.
Evaluation of polyethylene box liners and diphenylamine for storage of apples.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 57-70, bibl. 15.

In storage tests with 5 apple varieties, wraps containing 1·5 mg. diphenylamine (DPA) gave better scald control than conventional mineral oil wraps. Excellent scald control was obtained by dipping fruit in 1,000 p.p.m. or 2,000 p.p.m. DPA, but some varieties were injured by the higher concentration. DPA wraps and dips were effective in controlling scald on fruit packed in polythene-lined boxes. Scald development was found to be related to the oxygen level maintained round the fruit, a level of 3–5% giving good scald control. Sealed 1·5 mil. polythene liners usually reduced scald development, but they did not give good commercial control, because oxygen concentrations within the liners were too variable. Perforated polythene liners often increased scald and also increased internal breakdown of some varieties. Sealed 2·0 mil. polythene liners lacked sufficient permeability and suffocated fruit in 31° F. storage. [For earlier work see *H.A.*, 27: 3182.]—U.S. Dep. Agric., Beltsville, Md.

3302. Martin, D.
A simple method of applying diphenylamine to fruit.
Food Pres. Quart., 1959, **19**: 9-10, bibl. 2.

Apples were passed through steam impregnated with DPA which was deposited on the skin. With a 10 sec. run about 0·05 mg. DPA was deposited on each fruit. Scald was considerably reduced in treated apples.—C.S.I.R.O., Hobart.

3303. Smock, R. M., and Yatsu, L.
Apple volatile effects on the ripening of Cortland apples.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 71-7, bibl. 5.

Ripe apple vapours aspirated over pre-climacteric Cortland apples held at 33° F. did not increase their rates of respiration or softening, in contrast to the results obtained previously [see *H.A.*, 26: 3399]. In a recirculation system there appeared to be slight autostimulation of pre-climacteric Cortland apples at 2 storage temperatures. Three air purification agents (sodium hydroxide, contrated sulphuric acid and activated carbon) used in this system tended to minimize this ripening effect. It is concluded that either there is a small effect of volatiles on ripening under restricted ventilation conditions, or that this particular system produces an unexplained artifact.—Cornell Univ., Ithaca, N.Y.

3304. Ogata, K., Murata, T., and Iwata, T.
Studies on the metabolism of apple fruits and the production of volatile substances. Aldehyde, with reference to the mechanism of scald. [Japanese, with English summary 1 p.]
J. hort. Ass. Japan, 1959, **28**: 12-18, bibl. 33, illus.

In ethylene storage (concentrations lower than 1,000 p.p.m.) fruits of several apple varieties showed an after-ripening effect. At 5,000 p.p.m. of ethylene fruits softened and became discoloured, but no scald appeared; O_2 uptake was reduced, but without appreciable change in the respiration quotient. Storage in vaporized alcohol did not induce scald. In acetaldehyde, however, fruits produced scald-like symptoms, which increased with concentration. The respiration of acetaldehyde-induced scald tissues of both peel and pulp was considerably reduced. Substances which reduced the activity of respiration enzymes also reduced the inhibition of O_2 consumption by 50% in apples suffering from acetaldehyde-induced scald, in comparison with healthy fruits. It is concluded that in "scald" apples O_2 must be consumed in some way other than in ordinary respiration. The effect of succinate was similar in healthy fruits and those with scald, but pyruvate caused abnormal fruits to generate about twice as much CO_2 as was produced by healthy fruits. A decrease in the ascorbic acid content of fruits showing scald became more marked as the disorder progressed. There were no significant changes in organic acid contents during the course of the breakdown.

3305. de Haas, P. G., and Ewald, K.
Die Lagerung von Weichobst mit und ohne Ozonbegasung. Ein Beitrag zur Ozonfrage. **(The storage of soft fruit in the presence and absence of ozone. A contribution to the problem of ozone.)**
Gartenbauwiss., 1958, **23**: 392-400, bibl. 5.

Several varieties of acid cherries, strawberries and red and black currants were kept at 4° C. and 80–85% relative humidity in two storage rooms, in one of which an ozone concentration of 2 p.p.m. was maintained. Storage life was shown to vary with the variety. In the case of acid cherries, picking with the stalk greatly reduced fruit rots after 20 days' storage as compared with pulled fruits. In all the fruits studied, ozone treatment reduced losses from fruit rots by about 25%. In respect of acid and sugar contents, however, there was little difference between the two lots, as ozone did not retard physiological decomposition. In acid cherries and strawberries the flavour was not consistently improved by the treatment. Ozone decreased the fungus spore content of the air by only about 33%. It is thought that an ozone concentration higher than 2 p.p.m. would have had a better effect.—Inst. Obstb. u. Baumsch., tech. Hochsch., Hannover.

Fruit drying.

3306. Grace, M. R.
Methods and equipment for the use of solar energy in the drying of fig fruits. [Arabic summary 1¼ p.]
Ann. agric. Sci. Cairo, 1957, **2**(2): 277-92, bibl. 10, illus.

Various methods of drying Sultani figs were tested and 3 types of solar drier built. Scalding increased the drying rate and sulphuring improved the colour of the dried fruit. Scalding followed by sulphuring improved colour, consistency and skin texture. A type of solar drier is described which gave better results than drying in ordinary sunlight.

3307. Ballschmieter, H. M. B., and Olivier, O. J.
Spraying and dipping of prunes practicable.
Fmg S. Afr., 1959, **35**(1): 24-5.

Residues of captan, applied at 0·1% to prunes to control decay before sun-drying, were between 4·4 and 5·8 p.p.m. after 14 days. Similar residues were present irrespective of whether the lye was washed off before the captan application or not. After a captan application of 0·3%, residues were only reduced by 3·7 p.p.m. during 11 months in storage. Captan residues were entirely destroyed within 30 min. in boiling water.—Fruit Res. Stat., Stellenbosch.

Noted.

3308.

a ADAMSON, N. J.
History of fruitgrowing in Nelson.
N.Z. J. Agric., 1959, **98**: 70-81, 167-75, illus.
Pome fruits have been grown and marketed since 1865.

b ADRIAN, P. A., AND FRIDLEY, R. B.
New catching frame.
West. Fruit Gr, 1959, **13**(6): 29-30, illus.
For use with a boom shaker in prune harvesting.

c ANON.
Cherries. Speeds up packing.
Amer. Fruit Gr, 1958, **78**(11): 18, illus.
A machine for cutting stems of fruit clusters.

d ANSTEY, T. H.
Contrasting problems in apple production and marketing in British Columbia and Nova Scotia.
A.R. N. Scotia Fruit Grs' Ass. 1958, pp. 43-9.
Climate, culture and sales compared.

e BAILEY, C. H., AND HOUGH, L. F.
An hypothesis for the inheritance of season of ripening in progenies from certain early ripening peach varieties and selections.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 125-33, bibl. 12.

f BARGIONI, G.
La coltivazione del pero nella provincia di Verona. **(Growing pears in the province of Verona.)**
Agric. Venezie, 1959, **13**: 167-83, illus.
Production, soils, varieties, rootstocks and training systems.

g BROWN, A. G.
The inheritance of mildew resistance in progenies of the cultivated apple. [Dutch summary ½ p.]
Euphytica, 1959, **8**: 81-8, bibl. 3.
Beauty of Bath and Lord Lambourne were the most valuable parents.

h COE, F. W.
Extremely dwarf apple trees.
Nat. hort. Mag., 1959, **38**: 116-17, illus.
Performance of several varieties on a very dwarfing crab stock.

i DAHLING, R.
On this ranch the machines do the work.
West. Fruit Gr, 1959, **13**(6): 15-17, illus.
Mechanical harvesting and drying of prunes.

j DAYTON, D. F.
Progress in breeding scab-immune apples.
Trans. Ill. St. hort. Soc. 1958, 1959, **92**: 54-6, bibl. 1.
Using *Malus floribunda*, *M. prunifolia* and Russian seedlings.

k (DUVEKOT, W. S., AND VAN BELLE, G.)
In welk fust opslaan? **(Which boxes for storage?)**
Fruitteelt, 1959, **49**: 644.
Large boxes, with a lining of corrugated paper, recommended for cold storage of apples.

l EFIMOV, V. A.
The sequence of flowering in different varieties of cherry and plum. [Russian, with English summary 5 lines.]
Izv. Timiryazev. seljsk. Akad., 1959, No. 1, pp. 165-74.

m EMMERT, F. H.
Chemical analysis of tissue as a means of determining nutrient requirements of deciduous fruit plants.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 521-47, bibl. 160.
A review.

n FEUCHT, W.
Zur Alternanz beim Apfel. **(On biennial bearing in apples.)**
ErwObstb., 1959, **1**: 11-14, bibl. 16.
A review.

o (FINNISH FRUIT GROWERS' SOCIETY.)
Kotitarhoissa viljeltäviksi suositeltavat omenalajikkeet hyväksytty. **(Apple varieties recommended for cultivation in home gardens.)** [English summary 1 line.]
Puutarha, 1959, **62**: 254.
Summer, autumn, winter and crab apple varieties listed for the 5 fruit-growing areas of Finland.

p FRITSCHE, R.
Ist die Bevorzugung der Sorte Schneiderapfel als Kronenbildnersorte berechtigt? **(Are we justified in preferring the apple variety Schneiderapfel as a crown builder?)**
Schweiz. Z. Obst- u. Weinb., 1959, **68**: 231-8, illus.
Tests at Wädenswil have shown its superiority.

q (GANAWAY, J. W., AND CREMINS, W. J.)
Forecasting peach maturity in Colorado.
Amer. Fruit Gr, 1958, **78**(11): 20B, illus.
Based on daily maximum temperatures before July 1, with an adjustment for early flowering.

r GENA, N.
Cultural practices in relation to the growth of aerial and root systems of the apple variety Antonovka grafted on different rootstocks. [Russian, with English summary 8 lines.]
Izv. Timiryazev. seljsk. Akad., 1959, No. 1, pp. 149-64, bibl. 3, illus.
The distribution of roots of 4 rootstocks, and the growth, flowering and cropping of the variety.

s HATCH, M. D., AND OTHERS.
Oxidation of Krebs cycle acids by tissue slices and cytoplasmic particles from apple fruit.
Aust. J. biol. Sci., 1959, **12**: 167-74, bibl. 23.

t HERRMANN, C.
Grundlagen und Problematik einer obstbaulichen Standortskartierung unter besonderer Berücksichtigung der Verhältnisse im Land Bayern. **(The principles and problems involved in mapping localities suitable for fruit growing, with special reference to conditions in Bavaria.)**
Gartenbauwiss., 1958, **23**: 454-75, bibl. 25, illus.

u HUSABØ, P.
Kjemisk tynning av blomst og kart hos frukttre. Oversikt over forsøksmeldingar fra utlandet. **(Chemical thinning of flowers and fruits in fruit trees. A review of foreign results.)**
Mim. Rep. Inst. Fruit Growing Fruit Pres., Norweg. Coll. Agric. **6**, 1958, pp. 23, bibl. 36.
Mainly apples, but also pears and stone fruits; results arranged in alphabetical order of countries.

v (JONES, M. B.)
Speeded-up germination.
Amer. Fruit Gr, 1958, **78**(10): 14.
Fresh peach seeds treated with GA will produce seedlings in about 15 days.

w KARNATZ, H.
Zum gegenwärtigen Stand der Unterlagenfrage in Deutschland. **(On the present position of the rootstock problem in Germany.)**
ErwObstb., 1959, **1**: 28-32.
With special reference to apples, cherries and plums.

x KEMMER, E., AND MANTE, W.
Über die Abgrenzung des Erwerbsobstbaues vom Selbstversorgerobstbau. **(On the demarcation line between commercial and domestic fruit production.)**
ErwObstb., 1959, **1**: 2-6, bibl. 17.

y LALATTA, F.
La concimazione degli alberi da frutto. **(The manuring of fruit trees.)**
Frutticoltura, 1959, **21**: 253-65, bibl. 37, illus.
A review of Italian, French and North American work.

z LESLIE, N.
New prune picking machine.
Amer. Fruit Gr, 1958, **78**(12): 21, illus.
Invented by R. Shipley; fruit is picked up by flexible belts, at a maximum rate of 3 boxes per minute.

3309.

a McGILLIVRAY, K. D.
Water storage as a means of stabilising fruit growing.
Agric. Gaz. N.S.W., 1959, **70**: 1-5, illus.
Irrigation water conservation.

b McMECHAN, A. D.
Bulk handling of fruit in British Columbia.
Proc. Wash. St. hort. Ass. 1958, pp. 57-9.
See *H.A.*, 29: 1159.

c MARGOLIN, A. F.
Dwarf apple and pear trees in the Crimea. [Russian.]
Priroda, 1959, **48**(4): 109-10, illus.
The most important variety is the White Calville winter apple.

d MARTIN, H.
Two new peach rootstocks.
Fruit Var. hort. Dig., 1959, **13**: 45.
Rancho Redleaf and Rancho Resistant, from California, show resistance to nematodes.

e MONOYER, G., AND TRZCINSKI, T.
Le rôle du manganèse en arboriculture fruitière. **(The role of manganese in growing fruit trees.)**
Bull. hort. Liège, 1959, **14**: 171-6, bibl. obtainable from authors.
A review.

f MORETTINI, A.
Il miglioramento genetico dei fruttiferi in Italia. **(Italian contributions to progress in fruit breeding.)**
Riv. Ortoflorofruttic. ital., 1958, **42**: 482-99, bibl. 23, illus. [French edition in *Congrès pomol., 89^{me} Session, 1958*, 1959, pp. 19-32.]
A review.

g MORETTINI, A.
Le cultivar di pesco per i frutti sciroppati. **(Peach varieties suitable for canning.)**
Riv. Ortoflorofruttic. ital., 1959, **43**: 3-18, bibl. 10, illus.
See also *H.A.*, 29: 1176c.

h DE MOS, D.
Nieuwe verpakking voor perziken: de Quick box. **(A new peach pack; the Quickbox.)**
Fruitteelt, 1959, **49**: 576-7, illus.
4 peaches per carton.

i N.S.W. DEPARTMENT OF AGRICULTURE, DIVISION OF HORTICULTURE.
Thinning of stone fruits. Thinning peaches and plums in coastal districts.
Agric. Gaz. N.S.W., 1958, **69**: 547-9, illus.
Advice on thinning including lists of varieties which need it.

j NYBOM, N.
On the inheritance of acidity in cultivated apples.
Reprinted from *Hereditas*, 1959, **45**: 332-50, bibl. 17, illus.

k NYHLÉN, Å.
Vaxning av äpplen. **(The waxing of apples.)**
Fruktodlaren, 1959, **30**: 74-6, 87.
Swedish trials with several foreign preparations discussed.

l PAPERA, D. R.
Rise and decline of the California apple industry.
Diss. Abstr., 1959, **19**: 2502-3, being *L.C. Card No. Mic.* 59-280 of 205 pp.
An economic and historical study.

m PAYNE, C. B.
Apple growing at Inyanga.
Rhod. agric. J., 1959, **56**: 1-12, bibl. 31, illus.
A description and appraisal of 40 varieties under Rhodesian conditions.

n Pflug, I. J., and DEWEY, D. H.
Construction for controlled-atmosphere apple storage.
Agric. Engng St. Joseph, Mich., 1959, **40**: 80-3, 86, bibl. 8, illus.
The storage structure, sealing, refrigeration, auxiliary equipment and operation.

o REICHEL, M., WÜNSCHE, J., AND MEIER, G.
Arbeitswirtschaftliche Untersuchungen an Kern- und Steinobstbeständen in Prussendorf. **(Studies on the labour economy of pome and stone fruit orchards at Prussendorf.)** [Russian and English summaries 13 lines each.]
Arch. Gartenb., 1959, **7**: 83-111, bibl. 14.
On a large fruit farm in East Germany.

p SCARAMUZZI, F.
Contributo allo studio delle cultivar locali italiane di ciliegio acido. **(Sour cherries, some local Italian varieties.)**
Riv. Ortoflorofruttic. ital., 1959, **43**: 120-46, bibl. 27, illus.
Pomological descriptions of 9 cultivars.

q SCARAMUZZI, F.
Dalla Turchia, quattro cultivar di ciliegio acido. **(Four sour cherry cultivars from Turkey.)**
Frutticoltura, 1959, **21**: 269-80, bibl. 16, illus.
Katirli, Kisik, Kütahya and Tekirdag show promise for north Italy.

r SCHAER, E.
Eine Tabelle über die Essreife und Lagerfähigkeit von Kernobstsorten im Hauskeller. **(Tabulated data on eating maturity and storage life of pome fruit varieties in domestic cellars [in Switzerland].)**
Schweiz. Z. Obst- u. Weinb., 1959, **68**: 284-7.
Concerning 24 apple and 17 pear varieties kept at 4–7° C. and 10–15° C. respectively.

s SCHANDER, H.
Aufgaben und Möglichkeiten der Züchtung neuer Apfelsorten. **(Objects and possibilities in the breeding of new apple varieties.)**
Mitt. ObstVersuchsringes Jork, 1959, **14**: 126-34, bibl. 8.
Choice of parent, selection and methods of shortening the time between seed germination and fruiting.

t STOLL, K.
Aktuelle Fragen der Obstlagerung. **(Topical questions on fruit storage.)**
Schweiz. Z. Obst- u. Weinb., 1959, **68**: 157-63, 185-90, bibl. 9, illus.
A review on apple storage in Switzerland, with special reference to physiological disorders and pre-cooling.

u TRENKLE, R., AND POMPEJUS, O.
Prüfung von Apfel-Saatgutspender-Sämlingspflanzen für ihre vegetative Vermehrungsfähigkeit. **(Tests of apple seedlings from selected mother trees with respect to their vegetative propagation.)**
Ber. Bayer. Arbeitsgemeinsch. Obstb., 1958, **2**: 64-70.
The rooting performance of stooled clones.

v VON VAHL, E.
Die Ausgangssorten für die modernen Apfelsortimente. V. Worcester Parmain und seine Familie. **(The origin of modern apple varieties. V. Worcester Pearmain and its progeny.)**
Mitt. ObstVersuchsringes Jork, 1959, **14**: 88-90, bibl. 10.
For parts I-IV see *H.A.*, 29: 2187c.

w VON VAHL, E.
Weitere Ergebnisse der Befruchtungsversuche bei Süsskirschen. **(Further results of pollination experiments with sweet cherries.)**
Mitt. ObstVersuchsringesJork, 1959, **14**: 87-8.
Tabulated data on 14 varieties. [For earlier work see *H.A.*, 27: 181w.]

x VASIL'ČENKO, G. V.
Some characteristics of *Malus pallasiana* Juz. in the Altai mountains. [Russian.]
Bot. Žurnal, 1959, **44**: 113-15, bibl. 12.
Wild and garden forms of the Siberian apple, with reference to its use as a hardy rootstock.

y VIEIRA NATIVIDADE, J., AND NATIVIDADE SANCHES COELHO, J. M.
Novas variedades portuguesas de pessegueiros. **(New Portuguese peach varieties.)** [French and English summaries ¼ p. each.]
Bol. Junta nac. Frut. Lisbon, 1956, **16**: 7-13, illus., [received 1959].
Descriptions of 8 varieties. Portuguese × American hybrids show great promise.

z VINCENT, A. E.
Thinning of canning apricots and peaches.
Agric. Gaz. N.S.W., 1958, **69**: 549-51, illus.
Why, when and how to thin.

3310.
a WATANABE, T., SHIGETA, T., AND NAKAJIMA, G.
Transportation of peach fruits in Danball packages. [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat. hort. Branch, 1959, No. 7, pp. 23-5, illus.
Suitable only for high grade fruit in luxury trade.

b WATSON, W. W.
Good production in Delta peach variety tests.
Miss. Fm Res., 1959, **22**(1): 8.
Georgia Belle gave highest average yield of 10 varieties over first 3 years of cropping.

c WECA.
Steunmateriaal en verankering. **(Supports and anchorage.)**
Fruitteelt, 1959, **49**: 346-7, illus.
End-stakes and their anchorage, for wire-trained fruit trees.

d WESTWOOD, M. N., AND BATJER, L. P.
Predicting harvest size of Elberta and J. H. Hale peaches during the thinning period.
Proc. Wash. St. hort. Ass. 1958, pp. 175-7.
See also *H.A.*, 29: 2165.

e WOODHEAD, C. E.
Bitter pit in apples.
N.Z. J. Agric., 1959, **98**: 135-6, illus.
Description, and ways of reducing incidence.

f WOODHEAD, C. E.
Grassed orchards in New Zealand: a review of developments.
N.Z. J. Agric., 1959, **98**: 323-8, bibl. 4, illus.
See *H.A.*, 29: 2187e.

g ZIELINSKI, Q., AND SISTRUNK, W. A.
Evaluation of sweet cherry varieties and selections in Oregon.
Fruit Var. hort. Dig., 1959, **13**: 35, 34.
Varieties for the fresh market and for canning.

SMALL FRUITS, VINES AND NUTS.

Small fruits.

(*See also* 3248, 3257, 3305, 3376a, b, e-g, m-p, u-w, 3377b, d.)

3311. HINTON, W. L.
Specialized soft fruit holdings.
Rep. Econ. Fruit Fmg, Dep. agric. Econ., Wye Coll. **4**, 1959, pp. 28, bibl. 6, 2s. 6d.

This report is based on a study of the economic performance of 10 small holdings in East Sussex producing soft fruit for the fresh market. It is concluded that capital requirements for soft fruit growing (£700 an acre) are lower than those for market gardening or dairy farming, both of which give a comparable livelihood. Labour expenses amount to £200 an acre, or two-thirds of total expenses. Soft fruit growing employs over three times as much labour as market gardening. Productivity of labour, however, is low, the net output per £100 of labour being only £150 in soft fruit. Profits varied widely in individual holdings. The average return on investment was 4%, while return on expenditure was 7%, rates similar to those of market gardens with an equal turnover. Financial success depended on ability to spread labour and equipment costs over higher outputs per acre. Some holdings were using labour at the rate of 1¼ acres per man, while on the more efficient ones 2 acres were covered by 1 man. This might make a difference between no profit and a profit of £300 per man employed. Output affected profits more than expenses. Plans for raising output depend on the choice of high revenue crops, balanced to give reasonable picking demands. On the smaller holdings where labour is not fully occupied, income can be increased either by keeping livestock or by growing soft fruit more intensively.

3312. WOOD, C. A., AND TULLOCK, B.
The cultivation of blackberries and loganberries in Scotland.
Scot. Agric., 1959, **39**: 28-30, bibl. 1.

Commercially these crops are scarcely grown at all in Scotland at present. A small observational trial planted at Mylnefield in 1952 is here reported on, with figures for yields and season of ripening. Of 6 blackberry varieties and selections, Ashton Cross gave the highest yield over 6 seasons, and was considered best in size and appearance of fruit, although its flavour was only fair. The loganberries had to be discarded after 5 seasons. The commercial future of these fruits seems likely to depend on the development of new varieties or hybrid forms, combining high yield and quality, early ripening and improved vegetative characters.

3313. HÅRDH, J. E.
Pensasmustikan viljelyä haittaavista tekijöistä Suomessa. **(Factors affecting blueberry culture in Finland.)** [English summary ½ p.]
Maataloust. Aikakausk., 1959, **31**: 131-40, bibl. 4, illus.

In variety trials Rancocas was the highest yielding and hardiest variety under Finnish conditions. Diseases and pests troublesome in Finland are described.—Hort. Res. Inst., Piikkiö.

3314. TREVETT, M. F.
Growth studies of the lowbush blueberry, 1946-1957.
Bull. Me agric. Exp. Stat. **581**, 1959, pp. 58, bibl. 7.

These growth studies were designed to evaluate relationships between criteria used to measure the response of lowbush blueberries to fertilizers and soil amendments. The response can be evaluated either by yield of fruit or by measurements of changes in stem length, number of fruit buds per stem, number of blossom buds per fruit bud, or number of branches per stem. A combination of both yield and measurement data is most desirable. Sources of experimental error and methods of minimizing them are discussed.

3315. U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL MARKETING SERVICE.
Pre-cooling cranberries improves market quality.
Agric. Mktg, 1959, **4**(3): 11.

Cranberries which are precooled before transit can be satisfactorily held at 40–45° F. in transit. After shipment, decay in precooled fruit was only half that in similar shipments of non-precooled fruit. Freshly-harvested and precooled berries were much less susceptible to decay than fruit that had been stored for 3–4 weeks.

3316. VITKOVSKIJ, V. L.
The effect of short days on the formation of generative organs in a long-day variety of black currant. [Russian.]
Fiziol. Rast., 1959, **6**: 367-9, bibl. 13, illus.

The Igarka form of the Siberian subspecies of black currant is exceptionally hardy [see also *H.A.*, 28: 3406] and is therefore valuable for fruit production in areas with a severe climate and for use as breeding material. It grows very satisfactorily on the Kola Peninsula where it was given short-day (8 to 14 hrs) treatments during the growing period to ascertain whether it would grow further south. A 12-hr. day was minimal for flower bud differentiation, while at day lengths of 14 hrs and above very good results were obtained, indicating that this form could be introduced into the Karelian ASSR, Archangelsk, Leningrad and other regions of the N-W area of the U.S.S.R.

3317. BJURMAN, B.
The photosynthesis in diploid and tetraploid *Ribes satigrum.*
Physiol. Plant., 1959, **12**: 183-7, bibl. 8.

The diploid used in these studies was a sterile F_1 hybrid between *R. sativum* and *R. nigrum*, and the tetraploid was a fertile, colchicine-treated F_1 plant. The diploid had a higher rate of photosynthesis, a slightly lower chlorophyll content and about 45% more stomata per given leaf area than the tetraploid.—Inst. Plant Physiol., Lund.

3318. BLOOD, J. W., AND HEPPELL, J.
Manuring of black currants.
Exp. Hort., 1959, No. 2, pp. 43-8, bibl. 2.

In experiments black currants showed a large response to N manuring, but the maximum response had not been reached at the highest level of application, viz. 10 cwt./acre of sulphate of ammonia. Yields were higher with a single spring application of sulphate of ammonia than with a split application in spring and autumn. Straw mulching did not improve yields, but reduced the depressing effect of split applications of N. An application of 2½ cwt./acre of muriate of potash was adequate.—N.A.A.S., Lincolnshire.

3319. DIJKSTERHUIS, H. P.
Bessenteelt aan draden? **(Currant growing on wires?)**
Fruitteelt, 1959, **49**: 270-1.

Costs of growing red currants on wires and as bushes are compared, but no definite conclusion is reached. Advantages of growing currants on wires are earlier bearing, lower costs of harvesting and cultivation, earlier crops and higher quality; disadvantages are higher capital expenditure and labour costs for training.—R.T.C., Groningen.

3320. WAY, R. D.
Elderberry varieties and culture.
Proc. N.Y. St. hort. Soc. 1959, pp. 222-5.

Large-fruited selections of the American elder [*Sambucus canadensis*] are being tested. The most usual method of propagation is by hardwood stem cuttings, 8- or 10-inch sections being cut from 1-year-old canes in late winter. Each cutting is two nodes long and is set with the top pair of buds at ground level. They root quickly and after a year can be transplanted. One-year-old plants are set 6 ft. apart in rows 10 ft. apart, 726 plants being needed per acre. Full production is reached after 4 or 5 years. They grow on soils with a wide range of texture, fertility, acidity and moisture, but will peter out if the soil is perpetually wet. They are shallow-rooted and cultivation should be restricted to weed control. A sawdust mulch accomplishes this and helps to retain moisture. Although not self-sterile, the presence of other varieties helps pollination and satisfactory fruit set. Average yields of 3 tons per acre can be expected. Some clusters develop up to 8 in. in diameter and when ripe weigh a pound. The plants are very hardy and are not subject to winter-killing in New York. Birds, however, are a definite problem. In the author's opinion, given high-quality productive varieties, this might become a commercially important crop.

3321. Eaton, E. L., Aalders, L. E., and Hall, I. V.
Hybrids of an interspecific cross of elder.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 145-6, bibl. 3.

Crosses between the Victoria variety of common elder [*Sambucus canadensis*] and the red elder [*S. pubens*] were made with the object of developing an earlier maturing commercially acceptable elder. Hybrid seedlings were obtained which were completely sterile, though they did bear moderate crops of fruit. The hybrids were highly uniform and were intermediate between the parents in most characteristics. [Authors' summary.]—Canada Dep. Agric., Kentville, N.S.

3322. Askew, H. O.
Raspberries at Marsden Research Farm.
A.R. Cawthron Inst. 1957-58, 1958, pp. 38-44.

In variety trials the highest yields were produced by Marcy and Lloyd George; Taylor, Marcy and Malling Promise made the most vigorous vegetative growth. Mulching with clover straw before picking reduced the rate of ripening but did not affect total production adversely. A sawdust mulch required a nitrogen supplement. Fertilizer trials indicated that phosphate was the most important nutrient required on the Wakefield soil.

3323. Lazareva, A. G., and Eliseev, Ė. I.
The influence of ecological conditions on the raspberry in the foothills of the Northern Caucasus. [Russian.]
Fiziol. Rast., 1959, **6**: 228-31, bibl. 2.

Raspberries grown in thin woodlands were more vigorous, had a longer growing season, overwintered better and gave much higher yields than those grown in exposed locations. Analyses of the leaves and of the canes during dormancy showed the sheltered plants to have a higher level of metabolism. The moisture content was also higher in the dormant sheltered plants, thus making them more frost resistant.

3324. Baumeister, G.
Eine Methode zur Keimungsbeschleunigung bei *Rubus*-Samen. Kurze Mitteilung. **(A method of accelerating germination in *Rubus* seed. Short communication.)**
Züchter, 1959, **29**: 185-7, bibl. 5.

Notching raspberry seeds resulted in 50% germination within 4 weeks. In varieties that germinated badly, notching considerably increased the percentage of germination.—Max-Planck-Inst. f. Züchtungsforsch., Köln-Vogelsang.

3325. Boynton, D., and Wilde, M. H.
Development of the black raspberry fruit. I. Seasonal increases in gross volume, dimension and dry weight.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 158-63, bibl. 9.

Two years' study showed that growth in volume for the aggregate fruits of the black raspberry follows the same double sigmoid pattern exhibited by the fruit of red raspberry, peach, plum, apricot and cherry. The rate of increase in total volume was greatest during the final stage of swelling. Red colour development coincided with the beginning of this stage, and the change to black occurred as the growth rate decreased shortly before physiological maturity. Drupelet growth followed the same pattern as that of the aggregate fruit. Hardening of the endocarp began approximately at the inception of the plateau (stage 2) of growth. Growth patterns of the receptacle coincided with those of the drupelets, and there are indications that expansion of the receptacle may be controlled by the growth of the drupelets. Dry weight increase was a continuous process, which suggests that the proliferation and maturation of the sclereids of the endocarp, as well as rapid embryo growth, are accompanied by continuous dry weight accumulation during the period of arrested growth of the outer drupelet tissue and receptacle. —Cornell Univ., Ithaca, N.Y.

3326. Tomkins, J. P., and Boynton, D.
A response to potassium by the black raspberry.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 164-7, bibl. 7, illus.

Black raspberry leaves collected from primocanes in August of 1956 contained 0·5 to 0·7% K on a dry weight basis. Many, but not all, plants showed a basal leaf scorch which was most obvious in July on primocanes, although some of the scorch was evident in early June. The application of sulfate of K greatly reduced the amount of basal leaf scorch during 1957 and 1958, while the plots not fertilized with K continued to show much scorch during the same period. The soil application of K in August of 1956 increased the leaf content of K from 0·65% to 1·15% by the following August of 1957. By 1958 the K treatment resulted in a 20%

increase in yield, a 25% increase in number of canes and a 100% increase in weight of dormant prunings. [Authors' conclusions.]—N.Y. agric. Exp. Stat., Geneva, and Cornell Univ., Ithaca, N.Y.

3327. BLASSINSKY, J.
Erdbeer-Sortenversuche 1954-1957. (**Strawberry variety trials 1954-57.**)
ErwObstb., 1959, **1**: 50-4.

The performance and characters of 13 varieties are described. The medium early Senga Sengana gave the highest yields. Macherauchs Frühernte was the earliest variety and also cropped well. Climax occupied the lowest place.—Staatl. Obst- u. GartenbStelle Oberfranken, Bamberg.

3328. ANON.
The Ogallala strawberry.
Neb. Exp. Stat. Quart., 1958, **5**(2): 15.

A product of the Platte Experiment Station, Nebraska, the Ogallala is an everbearing strawberry of excellent flavour and mild aroma, which holds its shape on canning and makes a superior frozen product. It is suitable for home gardens but is too tender for shipping. It withstands drought, is very resistant to leaf spot, and is dark red throughout. It is now being tested throughout the north central region of the Great Plains.

3329. RAUTAVAARA, T.
Olisiko mansikanviljelyssä etsittävä uusia menetelmiä? (**Should we try new methods in strawberry growing?**) [English summary 7 lines.]
Puutarha, 1958, **61**: 368-9, illus.

The new Danish method of strawberry propagation, developed by Mosegaard, is recommended for trial. Strawberry cuttings are taken on 1 July, rooted in sphagnum under constant mist and planted out after 10 days. A very heavy crop is produced in the first year. If planting is mechanized it is best to replant every year with new cuttings, thus eliminating weeding and disease problems.

3330. MANTE, W., AND FUNKE, W.
Aufwands- und Leistungsvergleich zwischen kurz- und langfristigem Erdbeeranbau. (**A comparison between expenditure and profits in short- and long-term strawberry cultivation.**)
ErwObstb., 1959, **1**: 36-40, bibl. 6.

Trials showed that the annual culture of closely planted (23×20 cm.) strawberries yielded considerably higher profits per unit area than the common method of growing strawberries for a term of three years. It is suggested that this finding is of particular interest to the small grower. The relevant data are tabulated.—Inst. Obstb. tech. Univ., Berlin.

3331. BOSSE, G.
Der Einfluss des Pflanztermins auf die Wurzelentwicklung der Erdbeere. (**The effect of planting date on root development in strawberries.**)
ErwObstb., 1959, **1**: 34-6, illus.

Observations on root systems were made through a pane of glass in a specially constructed subterranean hut. With regard to the development of strawberry roots, differences of 15 days in the spring planting date had little effect. Differences of 30 days in the autumn planting date (i.e. over the period mid-July to mid-September), however, greatly affected depth of penetration and total expansion. As fruit yields depend on the formation of a large root system and root growth ceases towards the middle of September, planting in early July is desirable. The early cessation of shoot and root growth, while the environmental factors are still favourable, appears to be due to the photoperiodic responses of the strawberry.—Inst. Obstb. Univ. Bonn and gärtner. Versuchsanst. Friesdorf-Bad Godesberg.

3332. PORTER, L. A.
Strawberries grown without soil cultivation.
N.Z. J. Agric., 1959, **98**: 265-6, illus.

This is a preliminary report of a trial at Levin in which plants of the varieties Talisman, Auchincruive Climax, Lassen and Merton Princess were inserted in a grass sward after treatment with a mixture of 50% amitrol and 85% dalapon. A balanced fertilizer was given and immediately afterwards part of the area was mulched with black polythene sheet 0·002 in. thick and 6 ft. wide, and part with sawdust to a depth of 1½ in. Although yields were not recorded in this trial, quality and quantity of fruit appeared to be comparable with those of the same varieties grown in a more normal fashion, and the necessity for further weed control was eliminated. A full report is promised at the end of the trial.

3333. VOTH, V., AND BRINGHURST, R. S.
Polyethylene over strawberries.
Calif. Agric., 1959, **13**(5): 5, 14, illus.

With a mulch of clear polythene, strawberry plants produced significantly higher early and total yields than plants under other types of plastic mulch, or without a soil covering. Soil temperatures under black polythene were very low, and this material is not recommended for strawberries unless weed control is of primary importance.

3334. KWONG, S. S., AND BOYNTON, D.
Time of sampling, leaf age and leaf fraction as factors influencing the concentrations of nutrient elements in strawberry leaves.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 168-73, bibl. 4.

Concentrations of N, P, K and Ca were so different in samples of leaflets and petioles of the same strawberry leaves that only one or the other fraction should be used for diagnostic work; leaflets are considered preferable to petioles. Age of leaf proved important in sampling, and during the period mid-June to mid-August the youngest mature leaves should be chosen. Further work is needed to evaluate possible influences of variety. —Cornell Univ., Ithaca, N.Y.

3335. Kirsch, R. K.
The importance of interaction effects in fertilizer and lime studies with strawberries.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 181-8, bibl. 11.

Fertilizer effects on Marshall and Northwest strawberries were studied at 3 locations in Oregon in 1954. N increased the yield of marketable berries at one location, the effect being independent of other fertilizer treatments, but at another location N was only effective when P was not applied. The time of application of N did not affect the yield of marketable berries, but spring application increased the yield of culls. There was no consistent effect of N on quality. P increased yield of marketable berries at one location, the increase being greater when lime was not applied. At another location P increased marketable yields only when N was not applied. P did not affect the yield of culls or quality. K increased marketable yields only when lime was also applied, but had no effect on the yield of culls. K consistently increased the soluble solids content of the fruit and reduced its moisture content. At one location lime decreased yields of marketable berries regardless of the fertilizer treatment, while at another it decreased yields only when K was not applied, the yield-depressing effect being greatest when P was also applied. Lime did not affect the yield of culls.—Oregon St. Coll., Corvallis.

3336. Il'inskij, A. A.
Fertilization of strawberries with microelements. [Russian.]
Sad i Ogorod, 1959, No. 4, pp. 56-8.

Results are given of 2 experiments on the soil application, and 1 on the foliar application, of trace elements to strawberries. Yields were increased in every case, except one in which foliar B was applied to one variety; the size of the berries was also increased. Mn and Mo improved flavour and Zn and Cu increased acidity, but B caused deterioration in flavour and breakdown of the flesh. Shape, colour and aroma were not noticeably affected. The trace elements were more effective under irrigated conditions, and the effect of soil applications was still apparent in the second year after treatment.

3337. Bystrova, A. I.
The effect of fertilizers, irrigation and runner removal on strawberry yields. [Russian.]
Sb. stud. nauč. Rabot. Kubansk. s-h In-t. 1956 (1957), No. 1, pp. 55-8, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,319.

On plots of 100 sq. m. 10N-25P-15K was applied in the furrow on April 28, furrow irrigation at 800 cu.m. per ha. was carried out on May 14, June 1 and June 23, and runners were removed 10–12 days after the beginning of fruit ripening. Irrigation alone increased the average yield of 6 varieties by 17%, fertilizers by 21%, fertilizers plus irrigation by 46% and runner removal plus fertilizers plus irrigation by 52%.

3338. Simons, R. K.
Irrigation of strawberries: summary of three year study.
Trans. Ill. St. hort. Soc. 1958, 1959, **92**: 45-51, bibl. 2, illus.

Supplemental irrigation applied during fruit bud formation increased the yields of Howard Premier and Vermilion in 3 seasons. Fruit size was increased in 1958 only.

3339. Kronenberg, H. G.
Poor fruit setting in strawberries. I. Causes of a poor fruit set in strawberries in general.
[Dutch summary ⅔ p.]
Euphytica, 1959, **8**: 47-57, bibl. 14, illus.

Poor fruit set of strawberries may be caused by unfavourable weather conditions (including frost) during flowering, flower injury by insects, mites or fungi, insufficient pollination under glass or in overcrowded beds, and unfavourable soil structure. These external factors may be alleviated by cultural measures. Inherent, genetically determined factors causing poor set are more serious. Two types of strawberry may be distinguished genetically, viz. an all-female type, which is heterozygous for the sex factor, and a hermaphrodite-male type which is homozygous for the sex-factor. The second type contains all forms from those with sterile pistils to those with few stamens.—I.V.T., Wageningen.

3340. Boynton, D., and Yatsu, L.
Effects of maleic hydrazide sprays on growth, fruiting and nitrogen metabolism of Sparkle and Catskill strawberry plants.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 174-80, bibl. 4.

MH sprays at 1,000 and 2,000 p.p.m. curtailed stolon growth and the number of rooting runners. When the first spray was applied in mid-August, after about 8 runners per plant had become established, some stimulation of branch crowns was apparent. Plots sprayed twice (August and September) in 1956 yielded less the following year than unsprayed plots; most of the yield reduction occurred in the early pickings. The average size of the fruit was increased by MH sprays, especially in the later pickings. When runner development was restricted by weather conditions, 2 sprays of MH at 2,000 p.p.m. reduced yields drastically, and hand thinning of runners resulted in higher yields than either MH treatment or no thinning (matted rows). MH sprays decreased protein N levels of young leaves and resulted in a striking increase in pipecolic acid. These metabolic effects are discussed.—Cornell Univ., Ithaca, N.Y.

Vines.

(*See also* 3262, 3376c, h-l, s, t, x-z, 3377a, 3380, 3699, 3951, 4144, 4158.)

3341. Matthews, C. D.
Vine growing in South Australia.
J. Agric. S. Aust., 1958, **62**: 184-93, 237-44, 278-84, bibl. 36, illus.

The history of the industry and its present status are described, together with an account of the main vine growing areas and vine varieties. The author includes useful lists of the varieties in the Springvale, Nurioopta and Roseworthy collections and of every variety introduced since 1836.

3342. (Scott, D. H., and Christ, E. G.)
Dix, new juice grape.
Agric. Res. Wash., 1959, **7**(10): 15.

This variety is vigorous and moderately productive, with black, medium-sized fruit of mild to neutral flavour. The soluble solid content in the juice ranges from 14 to 17%, and acidity from 0·5 to 0·8%. The pulp and juice are intensely red and can be used for blending with juices of other varieties.

3343. Celestre, M. R.
Grado di resistenza di alcuni vitigni alla peronospora. (**Degree of resistance of some vines to downy mildew.**)
Riv. Vitic. Enol., 1959, **12**: 147-50.

Lists are given of 6 categories of vine varieties with very high to very low resistance. Certain new hybrids show promise of high resistance.

3344. Saakjan, R. G.
Some biochemical processes in vine varieties as related to their frost resistance. [Russian.]
Fiziol. Rast., 1959, **6**: 219-21, bibl. 4.

During the growing season frost-resistant varieties differed from frost-susceptible varieties in having a higher catalase activity, higher ascorbic acid content and a greater total oxidase potential in the leaves. During this period starch deposition in the shoots of frost-resistant varieties started much earlier, resulting in higher starch contents than were found in sensitive varieties. In the autumn, however, there was a much more rapid hydrolysis of starch in the frost-resistant varieties, the starch content falling to a lower level than that found in the sensitive varieties before the renewal of synthesis in the spring.

3345. Harmon, F. N., and Weinberger, J. H.
Effects of storage and stratification on germination of *Vinifera* grape seeds.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 147-50, bibl. 2.

In the tests over 4 seasons with Almeria grape seeds, the highest germination followed moist after-ripening treatment, either in storage at 33–40° F. or by stratification out-of-doors. Drying the seed at 65–70° F. after harvest and before stratification reduced germination slightly, while drying without subsequent stratification reduced it even more. Fairly high germination was obtained without after-ripening treatment if the seed was never dried. After-ripening treatment at 20° F. injured moist seed but did not injure or increase the germination of dry seed. Germination was much better in sand than in soil. A copper oxide seed dressing was beneficial only in the soil medium. In 2 years' tests with 6 varieties after-ripening treatment for 12 weeks resulted in higher germination than did shorter periods of treatment.—U.S. Dep. Agric., Fresno, Calif.

3346. Kovalenko, E. I.
The influence of certain alkaloids on the germination of vine seeds and the subsequent growth of seedlings. [Russian.]
Tr. Stavropol'sk. s.-h. In-ta, 1956, No. 7, pp. 173-80, from *Ref. Ž.* (*Biol.*), 1958, No. 7, Abstr. 30,064.

Stratified and washed seeds of 4 vine varieties were soaked for 48, 120 and 168 hours in aqueous solutions of nicotinic acid, nicotine, caffeine, ephedrine, phenamine, an extract from tubers of *Colchicum speciosum* and cocaine at 20, 50, 100 and 200 mg./l. The seeds were germinated at 16–22° C. and the seedlings transplanted into pots containing chernozem soil. With the exception of nicotine all treatments resulted in higher, more rapid and more even germination than in the controls, and the seedlings established themselves better on transplanting and grew faster.

3347. Šahova, L. N.
Hastening the fruiting of vine seedlings. [Russian.]
Vinodelie i Vinogradarstvo, 1959, **19** (1): 34-6, bibl. 10.

Vine seedlings were induced to fruit in their third or fourth year by stratifying the seed in moist sand at 0° to 5° C. for 3 months, sowing in nutrient blocks or pots and transplanting with the minimum of disturbance into well manured furrows. Subsequent treatment included irrigation, top dressing and early pruning and training.

3348. Luštinec, J.
The effect of β-indolebutyric acid on phosphatase and catalase activity in grape vine cuttings. [Czech and Russian summaries ½ p. each.]
Biol. Plant., Prague, 1959, **1**: 99-106, bibl. 27.

Vine cuttings after a quick-dip treatment with IBA showed increased phosphatase activity and decreased catalase activity until the appearance of the callus and first roots. Enzyme activity was determined over a wide range of temperatures.—Biol. Fac., Charles Univ., Prague.

3349. Leyvraz, H.
Essai de réchauffement du sol d'une pépinière viticole pour augmenter le pour-cent de reprise des greffés-soudés. (**Soil heating tests in a vine nursery to increase the percentage "take" of united grafts.**)
Rev. romande Agric. Vitic., 1959, **15**: 43-4, illus.

Soil temperatures under a white opaque plastic mulch were lower, and those under strips of clear plastic averaged 3° to 4° C. higher, than the temperatures of uncovered soil. Rooting of bench grafted vine cuttings was generally increased by a clear polythene soil covering, but the increases were variable.

3350. Polivcev, F. P., and Pomerancev, A. K.
The cultivation of direct-producer European varieties of vine, a powerful reserve of viticultural development in Moldavia. [Russian.]
Vinodelie i Vinogradarstvo, 1959, **19**(3): 38-41.

In the absence of sufficient grafted planting material and in view of the unsatisfactory performance of hybrid direct-producers, large scale planting of own-rooted European vines is recommended. Only the most phylloxera-resistant varieties should be used, preferably on light soils and planted at a distance of 1–1·5 km. from any possible source of infection. The plants should be treated with 2% BHC emulsion before planting them 55–60 cm. deep, and then dusted with γ-BHC. The root collar should be uncovered each spring and the surrounding soil dusted with BHC. If phylloxera appears, the vineyard should be fumigated immediately, otherwise fumigation can be carried out once every 3 years with dichlorethane or its derivatives.

3351. Guennelon, R.
Contribution à l'étude de l'érosion des sols du Bas-Rhône. I. Cas d'érosion sur vignoble dans le Gard. II. Sols sur sables miocènes et pliocènes dans le Vaucluse. (**Soil erosion in the lower Rhône Valley. I. In the vineyards of Gard. II. In the miocene and pliocene soils of Vaucluse.**) [English, German and Russian summaries.]
Ann. agron., 1956, **7**: 777-808, bibl. 7, illus., and 1958, **9**: 453-80, bibl. 4, illus.

In both these articles the calamitous results of erosion are illustrated in a region where the vine primarily, but also the cherry, apricot and olive are valuable crops but afford very limited protection to the soil. The erosion results in a heterogeneous soil composition, which with its varying lime content upsets resistance to chlorosis in vine rootstocks and makes the supply of nutrients and water uncertain. The damage is largely due to the neglect of protective measures such as contour planting, the construction of drainage ditches and protective banks and the growth of cover crops. As a result, plants decline, are swept away or engulfed. A complete reorientation of plantations would afford a solution. Meantime neglect to replace trees or vines with some vegetation, which would at least impede continued or increased erosion, gives every cause for alarm.

3352. Turkovic, Z.
Beitrag zur Frage der Pflanzenabstände in Weingärten. (**A contribution to the question of planting distances in vineyards.**)
Schweiz. Z. Obst- u. Weinb., 1959, **68**: 347-52.

Spacing trials are in progress in 12 vineyards of northern Croatia and Istria under the direction of the Institute of Viticulture and Oenology at Zagreb. Data on yields and quality associated with 3 planting distances are presented, and the advantages of different methods of planting and training are discussed.

3353. le Roux, M. S.
Large trellises give the earliest grapes.
Fmg S. Afr., 1959, **35**(4): 28-9, illus.

The proportion of fruit picked from wide trellises at the first harvest was much greater than that picked from narrower trellises. With 2 varieties first pickings from large trellises were approximately double those from narrow trellises, while with a third variety first yields were seven times as great.—W.P. Fruit Res. Stat., Stellenbosch.

3354. Bryant, L. R., Clore, W. J., and Woodbridge, C. G.
Concord grapes and petiole composition in some vineyards in the Yakima Valley.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 151-5, bibl. 6.

Studies made on 18 vineyards over a period of 4 years showed that yields were closely related to number of vines per acre. Yields were generally higher on loam soil than on clays or sands, but other factors such as available moisture and pruning appeared to be more important than soil texture alone. There was little difference in either the pH or soluble solids of expressed juice attributable to either yields or soil texture. Analysis of petioles showed that there was no correlation between nutrient level and yield.—Wash. agric. Exp. Stat., Pullman.

3355. VERGNES, —.
Sur un essai de fumure de la vigne. **(A manurial trial with vines.)**
Progr. agric. vitic., 1959, **151**: 214-19, bibl. 2.

In plots given any one of 3 types of N fertilizer in March the leaves were retained later in the autumn than in control plots. The refractive index was higher in control plots than in fertilized plots. Differences in yields and shoot growth were variable, but both were increased with nitrochalk (at 400 kg./N ha.). In sulphate of ammonia plots, yields were increased at 400 kg. N/ha., and shoot growth was increased at 800 kg. N/ha.—École nat. Agric., Montpellier.

3356. BUŠIN, P. M.
The dynamics of the nutrient requirements of the vine. [Russian, with Uzbek summary.]
Dokl. AN UzSSR, 1957, No. 1, pp. 49-53, from *Ref. Ž.* (*Biol.*), 1958, No. 7, Abstr. 29,409.

Figures are given for the percentages of N, P and K in different organs of 35-year-old vines determined at intervals from May to October. Nutrient uptake on a 5-year-old plantation was, in kg./ha., 36·7 N, 8·9 P_2O_5 and 48·9 K_2O from bud burst to the beginning of flowering; 6·9 N, 3·1 P_2O_5 and 16·0 K_2O from the beginning to the end of flowering; 57·6 N, 23·9 P_2O_5 and 135·0 K_2O from fruit set to the beginning of ripening; and 1·1 N, 10·5 P_2O_5 and 23·0 K_2O from the beginning of ripening to harvest.

3357. GOLUBEV, V. I.
Green manures in irrigated vineyards. [Russian.]
Sad i Ogorod, 1959, No. 3, pp. 62-5, illus.

In irrigated vineyards in the Crimea, where the soil moisture content was maintained at 70% of field capacity, the best soil management practice was found to be sowing green manure crops in alternate interrows with deep ploughing of the others, and reversing the process the following year. The green manure crops, peas with oats or a vetch-oats mixture, were sown in early spring at 100 kg./ha. of legume seed and 25 kg./ha. of grain, and were ploughed in at the beginning of flowering when irrigation was applied at 800–1,000 cu.m./ha. The nitrate content of the soil was increased, plant vigour and yields were improved and production costs were reduced by green manuring.

3358. HIDALGO, L., AND CANDELA, M. R.
El poder clorosante de los suelos calizos en el viñedo. **(The chlorosis-inducing power of limestone soils in vineyards.)** [French and English summaries ½ p. each.]
Bol. Inst. nac. Invest. agron. Madrid, 1958, **18**: 383-439, bibl. 56, illus.

Determination of active lime in the soil is described. Vine rootstocks available commercially in Spain are graded according to lime tolerance.

3359. ALLEWELDT, G.
Die Wirkung der Gibberellinsäure auf einjährige Reben bei verschiedener Photoperiode. **(The action of gibberellic acid on one-year-old vines given different photoperiods.)**
Vitis, 1959, **2**: 23-33, bibl. 46, illus.

The application of 0·3–1·0 mg./l. gibberellic acid to one-year-old vine cuttings and seedlings promoted shoot growth and thereby increased the weight of shoots and leaves. Fruit size and maturity were not affected by GA. It was not possible to use GA to break the dormancy of plants induced by photoperiodic treatment. The sensitivity of vines to the action of GA varied with the variety.—BundesforschAnst. Rebenzücht. Geilweilerhof.

3360. WEAVER, R. J., AND MCCUNE, S. B.
Response of certain varieties of *Vitis vinifera* to gibberellin.
Hilgardia, 1959, **28**: 297-350, bibl. 17, illus.

When 7 vine varieties were sprayed with GA the foliage and stems turned yellow after a few days and then reverted to their original colour. The treatment also caused stimulation of shoot growth and elongation of internodes. Black Corinth vines treated with concentrations ranging from 5 to 500 p.p.m. gave excellent sets of large berries, while Thompson Seedless gave similar results with 10 to 1,000 p.p.m. applied at full bloom. Ungirdled vines of the latter variety, treated at full bloom with 20 to 50 p.p.m., carried larger berries than untreated girdled vines [see also *H.A.*, 28: 2290]. Shoot elongation was greatly stimulated in Zinfandel by 1 to 1,000 p.p.m., but the higher concentrations caused longitudinal splitting and cracking of the shoots. Young Tokay shoots, when sprayed, produced larger leaves, elongated clusters and many shot berries. Little effect was noticed when flowering clusters of Ribier, Red Malaga and Muscat were sprayed, there being no increase in fruit set.—Univ. Calif., Davis.

3361. KRIMBAS, B. D., DAVIDIS, U. X., AND MICHAÏLIDIS, E.
Effects of gibberellin on Black Corinth and Sultanina grapes. [Greek, with English and French summaries ½ and ¾ p.]
[*Publ.*] *Athens Coll. Agric.*, 1959, pp. 36, bibl. 6.

Spray applications of GA at 10, 20 or 30 p.p.m. to Black Corinth grapes 3 days after full bloom increased fruit size and approximately doubled the yield of fresh fruit, as compared with control vines which were ringed at the same stage. The yield of dried fruit (currants) was approximately 50% higher, but the commercial grade was lower, than in the controls. Sultanina vines sprayed with 20, 30 or 50 p.p.m. GA solutions gave no clear positive response, but the raisins produced from their fruit were tougher and darker coloured than those of the controls.

3362. Tkačenko, G. V.
Flower and fruit drop of vines in Transcarpathia. [Russian.]
Nauč. Zap. Užgorodsk. gos. Un-ta, 1956, **17**: 49-73, from *Ref. Ž.* (*Biol.*), 1958, No. 7, Abstr. 30,062.

The rate of bud, flower and fruit drop showed great seasonal variation, being 47–68% in 1953 and only 10% in 1954. Drop was associated with environmental conditions impeding flowering, pollination and fertilization. Thus, in 4 varieties it increased from 49·2 to 68% when the temperature during flowering fell to 15° C. and below. The stage at which drop occurred showed varietal differences; in some varieties 20·4% of the buds dropped, while in others only 0·8%. In Transcarpathia liming the soil and the application of organic and mineral fertilizers reduced drop and created conditions favourable for normal pollination and fertilization.

3363. Cejtlin, M. G.
A method for obtaining more complete fertilization of flowers and better development of berries in bisexual varieties of vine. [Russian.]
Nauč. Tr. Uzb. s.-h. In-t, 1956, **9**(1): 197-215, from *Ref. Ž.* (*Biol.*), 1958, No. 8, Abstr. 34,825.

Poor berry development often occurs in functionally female and also in bisexual varieties of vine as a result of pollen sterility, poor transmission of pollen or failure in germination. Artificial inter- and even intra-varietal cross-pollination improved both the set and size of the berries. Supplementary artificial cross-pollination with mixed pollen increased yields by 7·3–38%, depending on variety. Commercially this was effected by blowing an air current from a duster across rows of vines or, better still, a current of air and sulphur when dusting against oidium. [See also *H.A.*, 28: 3444.]

3364. Amerine, M. A., and Roessler, E. B.
Field testing of grape maturity.
Hilgardia, 1958, **28**: 93-114, bibl. 11.

In 1956 three basic systems of sampling for fruit maturity were studied, namely, single berries taken from a large number of vines, single clusters taken from a smaller number of vines, and all the grapes taken from a few vines. The varieties sampled were Semillon, Carignane, Thompson Seedless and Flame Tokay, and one to four samplings were made during the season. The laboratory screw-type press used gave musts of 1–2° Balling higher than either the wooden roller or Garolla crusher. The musts were analysed for °Balling, °Brix, % reducing sugars, % total acidity and pH, after which the juice was fermented and the alcohol content determined. All 3 methods gave similar results, though the berry and cluster samples tended to be riper and the whole-vine samples to be more variable. As the frequency distribution of variation was not normal, further study is needed to establish its origin. Actual yields obtained were below the estimates made on the cluster and vine samples. The berry sampling method, being the simplest and quickest, will probably prove the most satisfactory method in practice.—Univ. Calif., Davis.

3365. Lavee, S.
Physiological aspects of post harvest berry drop in certain grape varieties.
Vitis, 1959, **2**: 34-9, bibl. 11.

Storage experiments were conducted with fruit of two varieties, Muscat of Hamburg and Dabouki. The drop of Muscat of Hamburg is a "dry drop", while the Dabouki has no definite drop. The shedding of berries in this latter variety was due mostly to mechanical injury. The dry drop, due to an abscission layer, was found to be a "physiological drop". This drop could be: (1) prevented by subjecting the fruit to cold storage immediately after picking; and (2) reduced by spraying the fruit 4 days before picking with 10–20 p.p.m. of NAA or PCPA if storage has to be postponed for more than 36 hours. Neither growth regulators nor delayed cold storage had any effect on the drop of Dabouki berries during storage. [From author's summary.]—Agric. Res. Stat. Rehovot, Israel.

Nuts.

(*See also* 3266, 3376d, q, r, 3377c, 4151.)

3366. Baldini, E.
La coltura del mandorlo in Spagna. (**Almond growing in Spain.**)
Riv. Ortoflorofruttic. ital., 1959, **43**: 19-33, bibl. 16, illus.

The area devoted to specialized almond growing in Spain has more than doubled between 1922 and 1955 and the production of almonds likewise. In 1955 production amounted to 1·7 million quintals from some 27 million trees on 171,000 hectares. The centre of production is in the Balearic Islands and round Alicante in South Eastern Spain. Accounts are given of the cultural care given to the trees, of the characteristics of the chief hard and soft shelled varieties and of the industrial organization which deals with the crop.

3367. Carrante, V.
Il miglioramento della mandorlicoltura italiana. (**The improvement of almond growing in Italy.**)
Riv. Ortoflorofruttic. ital., 1958, **42**: 579-87, illus. [French edition in *Congrès pomol., 89me Session, 1958*, 1959, pp. 127-34.]

Figures of almond production per ha. in the main producing provinces in Apulia and Sicily for the years 1948–52 were only about half those for the years 1920-25. Essentials for resuscitation of the industry in Italy appear to be: (1) better methods of cultivation, (2) improvement by breeding and selection, and (3) rationalization of plant protection measures. The Agricultural Experimental Station at Bari is seriously taking up these problems. The author cites the work done by this station in following up original work at the Brookhaven National Laboratory, New York, where almonds, Tuono and Fragiulia varieties, were submitted to either neutrons or X-rays, the seeds sown in 1957 and the performance of the resultant plants observed. So far all that can be said is that: (1) neutrons are probably more harmful than X-rays, (2) both treatments have generally ill effects on vitality except in very low doses, (3) less severe treatment (viz. N=40′–120′ with neutrons; R=2,000–6,000 with X-rays) seems harmless but stimulating. Characters sought in new varieties are discussed.

3368. Minafra, L., and others.
Coltura del mandorlo in Sicilia. **(Almond growing in Sicily.)**
Tecn. agric. (Num. spec.), 1958, **10**(1-2): 1-448, bibls, illus.

Italian horticulturists appear to be in two minds as to whether the European Common Market, into which they are launched, is a kindly wizard or a big bad bogey. Whichever it is, they are preparing to propitiate him by setting their house in order. Accordingly, in this large, glossy, well printed and pleasantly illustrated tome their experts, in particular Paolo Spina, describe the working of an industry which provides half the whole Italian export of almonds, itself only rivalled by that of Spain. Their essential strictures are directed to the almost universal habit of growing green crops, even cereals, in the almond orchards, the lack of any concerted effort to combat pests and diseases and a plain disregard for the benefits to be obtained from uniformity of production. Illustrated descriptions are given of the very numerous varieties grown, and a plea is made for the replacement of the non-economic varieties by others of established reputation. Among such specially commended are Pizzuta and Avola scelta.

3369. Parks, R.
Nut harvesting.
West. Fruit Gr, 1959, **13**(6): 21, 24, illus.

The following recent equipment is briefly discussed: an improved 3-wheel almond knocker with an air hammer, an improved almond catcher, the use of a prune and walnut pickup machine [see *H.A.*, 29: 150] for harvesting almonds, a pothole drier adapted for use with walnuts and almonds in pallet bins, and pruning towers for walnuts.

3370. Graves, A. H.
Hastening flowering in a chestnut seedling.
49th A.R. north. Nut Grs' Ass. 1958, Beltsville, Md, pp. 90-4, bibl. 6, illus.

A seedling of *Castanea henryi* flowered abundantly in its eighth year, following bark ring inversion the previous summer. The union was by-passed by inarching shoots from below the ring into bark above the ring to counteract a possible dwarfing effect.

3371. Riera, F.-J.
La pollinisation et la fécondation chez le noisetier. **(Pollination and fruit set in the cobnut.)**
Congr. pomol., 89^{me} Session, 1958, 1959, pp. 157-70, bibl. 2, illus.

A description, with particular reference to the favourite variety grown in the Taragon district of Spain, the Negret, of the conditions likely to favour a full crop. Wind, humidity and temperature all play their part. There is in the cob a long period, 2–3 months, between pollen emission and the complete formation of the ovary, the full development of the ovules and the maturity of the embryo sac. The planting of cross pollinators to the extent of 33% is advisable in the case of Negret.

3372. Duhan, K.
Neue Methoden und Erkenntnisse bei der Walnuss-Veredlung in Gewächshaus. **(New methods and observations in relation to walnut grafting in the glasshouse.)**
Besseres Obst, 1957, No. 8/9 and 1958, No. 7, reprinted in *Dtsch. Baumsch.*, 1959, **11**: 61-75, 119-26, illus.

By adapting methods and machines used in vine grafting, the author has succeeded in greatly simplifying the grafting of walnuts in Austria. The operation itself, and the after-treatment of the young plants, are described in detail and illustrated by 30 photographs.—Hochsch. f. Bodenkult., Vienna.

3373. Stritzke, S.
Anwachsergebnisse verschiedener Edelsorten-Unterlagenkombinationen bei der Veredlung von Walnüssen (*Juglans regia* L.). **(The formation of a union in different variety-rootstock combinations following the grafting of walnuts.)** [Russian and English summaries 12 lines each.]
Arch. Gartenb., 1959, **7**: 61-8, bibl. 6, illus.

Three walnut varieties, bred at Pillnitz, were tongue-grafted on to 5 different rootstocks raised from seeds of selected mother trees. The grafting was carried out in a glasshouse in February and March, the rootstocks being potted. Of all the factors affecting the "take" of grafts, a constant temperature of 27° C. during the operation and in the propagation bed proved the most important.—Inst. Gartenb. Dresden-Pillnitz.

3374. McDaniel, J. C.
Some aids to successful summer propagation of trees.
49th A.R. north. Nut Grs' Ass. 1958, Beltsville, Md, pp. 35-8.

Ferbam, painted on stock and budwood, was the most effective of the fungicides tested for preventing fungus infection of newly-budded walnut, pecan, mulberry, persimmon and pear trees. Zineb has also shown promise, but tended to reduce callusing. Polythene covers wrapped round the buds have prevented drying out, and with walnut and pecan patch-buds callusing was quicker under black than under transparent polythene. Girdle grafting (a form of bridge grafting) was successful with Asiatic persimmons which, under Midwest conditions, are difficult to propagate by T-budding or plate-budding.

3375. Serr, E. F.
Blackline in walnut.
Calif. Agric., 1959, **13**(3): 8-9, 14-15, illus.
Blackline of walnuts.
West. Fruit Gr, 1959, **13**(5): 23, illus.
Living with blackline.
Ibid., 1959, **13**(6): 35-6, illus.

Delayed incompatibility between Persian walnut (*Juglans regia*) scions and certain rootstocks shows itself as a thin black line of dead cambium and bark at the union, which gradually girdles the trunk [see also *H.A.*, 29: 2259]. Blackline is most common in trees on *J. hindsii* and on Paradox hybrids, but it has also occurred with *J. nigra*, *J. californica* and Royal hybrid stocks. Early-maturing scion varieties are more susceptible than late-maturing varieties. Contra Costa Perian has shown some promise as an interstock. There is no evidence that virus infection is involved. The growth of young replacement trees has been poor, but regrafting on to the trunk below the union or on to sprouts from the stock has been satisfactory. The use of resistant stocks is advised for new orchards in areas where a high proportion of blackline occurs.

Noted.

3376.

a Anon.
Two new blueberries.
Agric. Res. Wash., 1959, 7(9): 16.
Garden Blue and Menditoo, both suitable for the coastal plain from the Carolinas to Louisiana.

b Anon.
Strawberry runner cutter.
Amer. Fruit Gr, 1959, **79**(5): 30, illus.
A mechanical runner cutter, which can also be used as a cultivator.

c (Antcliff, A. J.)
Pruning the sultana.
Rur. Res. C.S.I.R.O., 1959, No. 27, pp. 12-13.
Based on crop forecasting by bud study [see also *H.A.*, 28: 3446].

d Berry, F. H.
Chinese chestnut orchards on the eastern shore of Maryland.
49th A.R. north. Nut Grs' Ass. 1958, Beltsville, Md, pp. 51-4, illus.
Bearing, manuring and weevil control.

e Blasse, W., and Freytag, H. E.
Vergleichende Fruchtfarbstoffmessungen von Himbeersorten. (**Comparative measurements of fruit colour in raspberry varieties.**)
Gartenbauwiss., 1958, **23**: 386-91, bibl. 4.
A rapid and exact method of determining colour intensity described.

f Britton, D. M., and Hull, J. W.
A black raspberry-blackberry hybrid.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 156-7, bibl. 3, illus.
Valuable for breeding work only.

g Christ, E. G., and Smith, C. R.
Small fruit varities grown in New Jersey.
Ext. Bull. Rutgers Coll. Agric., N.J., **314**, 1958, pp. 16, illus.
Strawberries, raspberries, blackberries, dewberries, red currants, gooseberries and blueberries.

h Cosmo, I., Benedetti, A., and Forti, R.
Terrano. (**The Terrano red wine grape.**)
Ann. Sper. agrar., 1959, **13**(1), Suppl. pp. xcvii-cvii, bibl. 11, illus.

i Cosmo, I., Forti, R., and Sardi, F.
Cabernet Sauvignon. (**The Cabernet Sauvignon red wine grape.**)
Ann. Sper. agrar., 1959, **13**(2), Suppl. pp. lxxv-lxxxiv, bibl. 5, illus.

j Cosmo, I., and Polsinelli, M.
Sylvaner verde. Negretto. Sémillon. (**Vine varieties Sylvaner, Negretto and Sémillon.**)
Ann. Sper. agrar., 1959, **13**(1), Suppl. pp. lxxi-lxxix, bibl. 8, illus.; lxxxi-lxxxviii, bibl. 9, illus.; lxxxix-xcv, bibl. 4, illus.
First and third used exclusively for wine, Negretto used also as a table grape.

k Cosmo, I., and Polsinelli, M.
Pinots. (**The Pinot wine grapes.**)
Ann. Sper. agrar., 1959, **13**(2), Suppl. pp. xxix-xlviii, bibl. 8, illus.
Varieties which are largely responsible for both the red and white wines of Burgundy.

l DALMASSO, G., AND OTHERS.
Discipline de la culture des producteurs directs dans les différents pays au regard du vin, du jus de raisin et du raisin de table. **(Restriction of the growing of direct-producer vines for wine, grape juice and dessert grapes.)**
Bull. Off. int. Vin., 1959, **31**(338): 21-51; (339): 3-18.
A general survey, and national reports from 14 countries [see also *H.A.*, 29: 1199].

m DODGE, J. C., AND SNYDER, J. C.
Growing raspberries in Washington.
Ext. Bull. St. Coll. Wash. **401**, revised 1958, pp. 15, illus.
Culture and varieties of black and red raspberries.

n GOODWIN, P. V.
New strawberry varieties from California. Heavy yields from trials in New Zealand.
N.Z. Gdnr, 1959, **15**: 467-9.
Behaviour of Shasta and Lassen.

o HÅRDH, J. E.
Rikalan vattu, kiintoisa vadelmalöytö. **(Rikala raspberry deserves interest.)** [English summary 7 lines.]
Puutarha, 1959, **62**: 133.
An unidentified Canadian variety of great promise in Finland.

p HAVERGAL, B.
The production of strawberries from one-year-old plants.
J. roy. hort. Soc., 1959, **84**: 213-22, illus.
Under heated glass, cloches and in the open, cropping from mid-April to mid-July.

q LEMAISTRE, J.
Le pistachier. **(The pistachio.)**
Fruits d'Outre Mer, 1959, **14**: 57-77, bibl. 31, illus.
A review of the literature dealing with all aspects of culture.

r MCDANIEL, J. C.
Pollination of the Juglandaceae; 1958 observations on varieties as to flower types.
49th A.R. north. Nut Grs' Ass. 1958, Beltsville, Md, pp. 64-6.
Of pecan, hickory and hican. [For work in 1957 see *H.A.*, 29: 2252i.]

s MAYER, R., AND OTHERS.
Méthodologie de l'expérimentation viticole. **(Methodology of viticultural experimentation.)**
Bull. Off. int. Vin., 1959, **31**(336): 22-40, bibl. 5; (337): 23-56; (338): 3-20.
A general review, followed by national reports from 11 countries.

t MAZZEI, A., AND ZAPPALÀ, A.
Nocera. **(The Nocera red wine grape.)**
Ann. Sper. agrar., 1959, **13**(1), Suppl. pp. CIX-CXVI, bibl. 3, illus.

u MINISTRY OF AGRICULTURE, LONDON.
Cultivation of raspberries.
Adv. Leafl. Minist. Agric. Lond. **180**, revised 1959, pp. 5.

v PANTON, J. S.
Cultivation of raspberries in northern counties [of Scotland].
Scot. Agric., 1959, **39**: 56-7.
Advice based on recent successful experience.

w POTTER, J. M. S.
Strawberry variety trial, 1956-57.
Exp. Hort., 1959, No. 2, pp. 34-42.
Cropping, returns and descriptions of 12 commercial varieties.

x RIVES, M., AND POUGET, R.
Le Chasselas Gros Coulard—mutant tétraploïde. **(The vine variety Chasselas Gros Coulard—a tetraploid mutant.)**
Vitis, 1959, **2**: 1-7, bibl. 17, illus.
The mutant should prove of interest in breeding, especially for dessert varieties.

y ŠERBAKOV, P. M.
Introduction of complex mechanization into vine growing in mountainous regions. [Russian.]
Vinodelie i Vinogradarstvo, 1959, **19**(3): 33-8, illus.
Mainly concerning heavy equipment for land preparation and the use of cable drawn implements.

z VIOLANTE, C., AND BORDIGNON, S.
Asprinio bianco. Piedirosso. **(The Asprinio bianco white and Piedirosso red wine grapes.)**
Ann. Sper. agrar., 1959, **13**(2), Suppl. pp. LXXXV-XCIV, bibl. 8, illus., and pp. XCV-CVI, bibl. 10, illus.

3377.

a WEAVER, R. J., WINKLER, A. J., AND MCCUNE, S. B.
Some effects of 2,4-dichlorophenoxyacetic acid and related compounds on the grapevine.
Amer. J. Enol., 1958, **9**(3): 126-38, bibl. 10.
Results of 8 experiments at Davis, Calif. See *Weed Abstr.*, **8**, No. 1169.

b WOOD, C. A., MCINTYRE, W., AND HALL, J. W.
Raspberry cultivation.
Adv. Leafl. Dep. Agric. Scotland **14** (n.s.), revised 1959, pp. 12, illus., 1s. 6d.
Text extended and photographs included since the last edition [*H.A.*, 25: 3633].

c ZARGER, T. G.
Nut variety tests in the Tennessee Valley.
49th A.R. north. Nut Grs' Ass. 1958, Beltsville, Md, pp. 39-44.
Black walnut, Chinese chestnut, filbert and pecan.

d ZYCH, C. C., AND MOWRY, J. B.
Strawberry variety performance in Illinois.
Trans. Ill. St. hort. Soc. 1958, 1959, **92**: 40-5.
Pocahontas was the most productive of 10 varieties tested.

PLANT PROTECTION OF DECIDUOUS FRUITS.

General.

(*See also* 3484n, 4158.)

3378. POLIAKOV, I. JA.
Methods of forecasting and warning on the appearance of pests and diseases in crops.
Reprinted from *Proc. IXth int. Conf. Quar. Plant Prot.*, Moscow, 1958, pp. 19.

The author considers both long term and short term forecasting of the incidence of all sorts of pests, including rodents, and of diseases. He considers in some detail the application of short term forecasting to such orchard curses as the cherry fruit fly (*Rhagoletis cerasi*), codling moth and vine downy mildew, and shows how control measures can be based on the summation of effective temperatures. Thus as regards downy mildew he notes that the incubation period lasts 4 days when the temperature is 71·6–77° F. (22–25° C.), 5 days when it is 66·2–68·8° F., 7–6 days when it is 62·6–64·4° F., 9–8 days when it is 59–60·8° F. and up to 15 days when it is 51·8–53·6° F. He sketches the organization of warning services in the U.S.S.R.

Disturbances of nutrition or of uncertain origin.

(*See also* 3207, 3256, 3286, 3358, 3375, 3485k.)

3379. LIWERANT, J.
Redressement d'une carence potassique du prunier d'Ente par la fumure profonde. **(Remedying K deficiency in d'Ente plum trees by deep manuring.)**
Ann. agron., 1958 (issued 1959), **9**: 399-401.

The test trees were planted in October 1951 without manure. Different amounts and combinations of N, P and K fertilizers were given, P and K being placed 45 cm. deep and N applied on the surface. It was found that trees suffering from K deficiency, having been supplied with N only, had to be given additional K for 3 years to restore them to normal. Observations on the young trees in 1957 showed that, whereas the NPK trees bore several dozen flowers, the N trees had only very few and the NP trees none. [See also *H.A.*, 27: 2189p.)

3380. BARNES, M. M.
Relationships among pruning time response, symptoms attributed to grape bud mite, and temporary early season boron deficiency in grapes.
Hilgardia, 1958, **28**: 193-226, bibl. 29, illus.

Certain abnormal growths on spur-pruned vinifera grapes in California, formerly attributed to *Eriophyes vitis*, have been found to be caused by a temporary early-season deficiency of boron, and to be related to the effect of pruning time on time of leafing. A soil application of borax resulted in almost normal growth, whereas applying zinc sulphate to the cut ends increased the abnormal development. In places where the disorder is likely to occur, early pruning (e.g. in January) for early leafing resulted in shortened basal internodes, excessive laterals, reduced crop, and leaf abnormalities, these last being of good diagnostic value. There was seasonal variation in the length of period in the winter during which buds responded to the adjacent pruning wound by early leafing and symptom development, but it generally occurred between mid-December and mid-January. Pruning in late March resulted in late leafing and in almost normal growth and cropping.—Univ. Calif., Riverside.

3381. ROSE, T. H., AND DERMOTT, W.
The control of iron deficiency in fruit trees by chelated iron compounds.
Exp. Hort., 1959, No. 2, pp. 49-53, bibl. 5.

The treatment of pear trees at 2 sites with Fe-EDTA at 12 oz. per tree, applied as a soil surface dressing or as a solution injected into the soil, or with Fe-EDTA as 0·075% foliar sprays, or by trunk injection with ferrous sulphate pills, all improved leaf colour, the best results being obtained with foliar sprays. Growth was improved by all treatments, particularly with soil injection of the Fe-EDTA solution. Yields were also increased with soil injection of Fe-EDTA solutions, but results with soil dressings and pill injections were variable; yields from trees sprayed with Fe-EDTA were often no better than those from untreated trees. With plum trees there was little difference in response to different Fe treatments.—N.A.A.S., Wye, Kent.

3382. CHABANNES, J., DUPRAT, A., AND TROCMÉ, S.
Observations sur le traitement de la chlorose des poiriers. **(Observations on the treatment of chlorosis in pears.)**
Ann. agron., 1958 (issued 1959), **9**: 413, bibl. 1.

The observations were carried out for 4 consecutive years on more than 200 trees in various orchards of the Paris district. The chelates FeEDTA, FeHEEDTA and FeDTPA were broadcast, injected with a fertilizer lance, or applied as a spray. Injection with a lance proved successful but expensive. Spraying gave a partial, temporary improvement and had to be repeated. No ill effects were noticeable in the foliage. [For a fuller account, see *H.A.*, 28: 2309.]

3383. FORSHEY, C. G.
The effect of nitrogen status of magnesium deficient McIntosh apple trees on the response to epsom salt sprays.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 40-5, bibl. 6.

McIntosh trees, deficient in both N and Mg, received 3 N treatments (0, ½ and 1½ lb. actual N per tree as ammonium nitrate) and 3 Mg treatments (0, 1 or 3 sprays of epsom salts) in factorial combination for 3 years. There was little or no response to treatments in the first year, but in subsequent years the N treatments markedly increased growth and yield of the trees and the N content of their foliage. Epsom salts sprays did not affect growth or yield, but they reduced preharvest fruit drop and foliage symptoms of Mg deficiency. They also significantly increased the Mg content of the foliage, 3 sprays being better than one. N fertilization had no effect on Mg concentration in the leaves of trees that received no epsom salts sprays, but increased it in the sprayed trees.—Hudson Valley Fruit Invest. Lab., Poughkeepsie, N.Y.

3384. WOODBRIDGE, C. G.
The nutrient content of Bartlett pear trees.
Proc. Wash. St. hort. Ass. 1958, pp. 155-7.

The main purpose of the survey was to determine whether "pear decline" is related to the mineral content of trees. The nutrient contents of spur leaves from bearing trees in the Yakima Valley have been examined with reference to N, P, K, Ca, Mg, Fe, B, Mn and Zn, and observations show that there is a wide range of nutrient contents present. In general, no deficiencies other than those due to low Zn and Mn contents are recorded in this study. It can therefore be assumed that a wide, but satisfactory range of nutrient levels can be expected in growers' orchards. Apparently B deficiency is being prevented by the annual application of B compounds. No evidence is forthcoming that pear decline is a nutritional problem.

3385. MÜLLER, H.
Beitrag zur Frage der Bodenmüdigkeit in Baumschulen. (**A contribution to the problem of soil sickness in nurseries.**)
Dtsch. Gartenb., 1959, **6**: 136-8, bibl. 2.

Four years' experiments with apple seedlings grown in a sick nursery soil showed that cover cropping for two years with a clover-grass mixture prior to planting the fruit trees largely cured soil sickness. This finding accords with observations made by nurserymen. A 10-year crop rotation, consisting of 4 years under fruit trees, 3 years under ornamentals and 3 years under clover-grass sward, is suggested for nurseries.—Inst. Gartenb., Dresden-Pillnitz.

3386. GILMORE, A. E.
Growth of replanted peach trees.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 99-111, bibl. 20.

Growth measurements were made on peaches planted on old peach soil in California. Poor growth occurred in the first and, occasionally, in the second year, followed by good (but not quite normal) growth in subsequent years. The replant effect was shown to be highly specific, though variable in degree of expression. Pre-planting treatment of the soil with carbon bisulphide resulted in only slight alleviation of the problem. The growth-depressing factor was only partially eliminated after 7 years of cultivation with crops other than peach. When peaches were replanted on land that had been infected with *Armillaria mellea*, and then treated with carbon bisulphide, growth was normal. It is suggested that the presence of certain soil organisms (such as *Armillaria*) may have an ameliorating effect on the depressing factor in old peach soils.—Univ. Calif., Davis.

3387. MOUNTAIN, W. B., AND PATRICK, Z. A.
The peach replant problem in Ontario. VII. The pathogenicity of *Pratylenchus penetrans* (Cobb, 1917) Filip. and Stek. 1941.
Canad. J. Bot., 1959, **37**: 459-70, bibl. 14, illus.

Investigations proved this nematode to be a true pathogen, but peach replant failure appeared to be mainly due to the nematode facilitating the entry of other parasitic organisms into the roots. [For part VI, see *H.A.*, 28: 1259.]

3388. ROSS, E., YANG, H., AND BREKKE, J. E.
Preliminary report on the brined cherry project, 1958 season.
Stats Circ. Wash. St. agric. Exp. Stats **340**, 1958, pp. 2.

An infection known as "catclaw" has been observed late in the season on fully mature cherries, which showed strong, pectinolytic enzyme activity causing rapid breakdown of the fruit in brine. Both Nacconal and calcium chloride have shown promise in counteracting the breakdown in brined fruit. A pectin-digesting yeast has been cultured from affected fruit.

Adverse climatic factors.

(*See also* 3223-3225, 3238, 3344, 3484t, 3485p.)

3389. OVERCASH, J. P., AND MURPHY, B. C.
Apple varieties react differently to mild winters.
Miss. Fm Res., 1959, **22**(1): 5, illus.

Apples in South Mississippi require colder winters than normally occur in this area. The winter of 1956-57 was very mild and caused prolonged dormancy, the worst affected varieties being Carlton, Cauley, Early Harvest and Improved Winesap, which bloomed 4–7 weeks later than normal. Trees of Anoka, Hackworth, Kosciusko and Transcendent Crab were least influenced.

3390. Overcash, J. P., and Loomis, N. H.
Prolonged dormancy of pear varieties following mild winters in Mississippi.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 91-8, bibl. 15, illus.

The winter chilling requirements of 43 pear varieties were studied in 3 locations in Mississippi over a period of 9 years. Most of the varieties tested did not show prolonged dormancy when the mean temperature in December–January was below 50° F. Varieties with short chilling requirements included Baldwin, Garber, Kieffer, Le Conte, Orient and Pineapple [see also *H.A.*, 28: 3298]. Those with long chilling requirements included Tyson and Waite.—Miss. agric. Exp. Stat., and U.S. Dep. Agric., Meridian, Miss.

3391. Kamínek, M., and Kamínek, L.
Vliv nízkých teplot na květy ovocných stromů. **(The effect of low temperatures on fruit blossoms.)** [Russian, German and English summaries 1 p. each.]
Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1959, **32**: 291-310, bibl. 34.

Observations in the laboratory and in the field on spring frost damage to flowers of apricots, plums, apples and pears are summarized. Unfolded blossoms may be hardened at temperatures near to 0° C., thus increasing resistance to low temperatures by 9–37%. The concentration of cell sap in the pistils is increased by hardening. There was an exponential relationship between increased frost resistance and contents of soluble solids. Flowers on branches with many leaves showed less injury than those on sparsely-leaved branches. Planting rows in a SE/NW direction is recommended to reduce early morning sunshine damage to frozen flowers.

3392. van Dijk, C.
Nachtvorstschade te Numansdorp. Waarnemingen op het fruitteeltproefbedrijf. **(Night frost damage at Numansdorp. Observations in the Experimental Fruit Garden.)**
Fruitteelt, 1959, **49**: 543.

Observations were made on apple, pear and plum varieties after a night of frost. Flowers of Cox were very sensitive to low temperature, while those of Golden Delicious were fairly resistant. Windbreaks gave some frost protection. Frost damage was reduced by sprinkler irrigation, and was less in clean cultivated soils than in grassed plots.

3393. de Zeeuw, J.
Nachtvorstwering door rook en nevel. **(Night frost protection by smoke and vapour.)** [English summary 10 lines.]
Meded. Dir. Tuinb., 1959, **22**: 149-53, 167.

Laboratory studies on artificially produced wood smoke, oil vapour, and a chemical smoke formed of zinc chloride particles showed none to be adequate for frost protection.—Inst. Tuinb. Tech., Wageningen.

3394. Magradze, E. G.
An effective method of restoring frost damaged vineyards. [Russian.]
Vinodelie i Vinogradarstvo, 1959, **19**(3): 27-9.

Of 3 methods tested in 2 frost damaged vineyards in Georgia, the highest yields in the second season after injury were obtained by cutting back the stems to 30–40 cm. and retaining 2 shoots, which, at the end of May, were tied out horizontally and pinched back to encourage axillary shoot formation.

3395. Gjaerum, H. B.
Fruktsprekking hos søtkirsebaer. **(Fruit cracking in sweet cherries.)**
Reprinted from *Yrkesfruktdyrk.*, 1958, No. 3, pp. 2.

In several years' trials, carried out in southern Norway, spraying with captan reduced fruit cracking in cherries by about 6–13% in comparison with the controls. Varieties especially liable to suffer from fruit cracking are enumerated.

Viruses.

(*See also* 3216, 3484a, d, k, q, v, 3485e, o.)

3396. Società Orticola Italiana.
Atti del primo convegno sulle malattie de virus dei fruttiferi e della vite, Pavia, 7-8 giugno 1958. **(Proceedings of the first [Italian] conference on virus diseases of fruits and vines, Pavia, June 1958.)**
Not. Mal. Piante, 1959, Nos. 47/48, pp. 242, bibls, illus.

General reports covered vine virus problems, vegetative propagation, work at Bologna on fruit viruses, vine virus work at Udine and the probable relation of virus to incompatibility between stock and scion. Shorter papers were presented on the following, among other, subjects: virus and tissue culture, new virus syndromes in fruit plants, stony pit of pear, apple mosaic, vine enation, a virus in chestnut and two in apricot, chromatography for identification, yellowing in kaki, a "silver leaf" virus in peach, yellows in olive, rubbery wood in apple, witches' broom in apple, leaf hoppers and infectious degeneration in vine.

3397. MORVAN, G.
Développement actuel de l'étude des viroses des arbres fruitiers en France. **(The present position regarding fruit tree virus investigations in France.)**
Congr. pomol. 89me Session 1958, 1959, pp. 88-95, bibl. 2.

The author, after noting the difficulty of diagnosing, identifying and controlling viruses, describes some of the main symptoms thought to show the presence of viruses in apricots, cherries, peaches, plums, pears and apples. Finally, he urges the necessity of imposing the most rigorous government regulations on nurserymen.

3398. SCARAMUZZI, G., CORTE, A., AND CARLONE, R.
Il legno di gomma del melo. **(Rubbery wood of apple trees.)**
Progr. agric., 1959, **5**: 701-3, illus.

Morphological and anatomical symptoms are described. In the Cuneo province of Italy, the disease has appeared only on the variety Golden Delicious grafted on Dolcino (M.II or M.V), while the same variety on seedling rootstocks is unaffected. The disease is latent in other regions of Italy, judging by tests on the indicator variety Lord Lambourne. It is unlikely that insects are vectors; thus control will depend on testing all material used in vegetative propagation.

3399. GUALACCINI, F.
Una virosi dell'albicocco. **(A virus of apricots.)** [English summary ½ p.]
Boll. Staz. Pat. veg. Roma, 1958 (issued 1959), **16**: 55-65, bibl. 13, illus.

The leaves of apricots affected by this disease show line pattern, ring spot and flecking symptoms of a light green to yellow colour. It was found capable of transmission by budding to other apricots, almond, peach, myrobalan plum and Shirofugen *Prunus serrulata* trees.

3400. SCHUCH, K.
Eine noch nicht identifizierte Virose des Pfirsichs. **(A virus disease of peach not yet identified.)** [English summary 4 lines.]
NachrBl. dtsch. PflSchDienst., Braunschweig, 1959, **11**: 92-3, bibl. 5, illus.

The leaf spot symptoms described are shown to be due to a virus, which is apparently closely related to peach asteroid spot and to purple peach mosaic.—Inst. f. Obstkrankh., Heidelberg.

3401. POBEGAJLO, I.
Mozaik smokve u Hercegovini. **(Fig mosaic in Herzegovina.)** [English summary ½ p.]
Rad. Poljopriv. Šumarskog Fak. Sarajevo, 1958, 7(9): 3-23, bibl. 18, illus.

The fig mosaic virus is transmitted by budding and grafting, and possibly also by the psyllid *Homotoma ficus* and the mite *Aceria ficus*. The economic importance of the disease has not yet been established.

3402. DE FLUITER, H. J., AND VAN DER MEER, F. A.
The biology and control of *Macropsis fuscula* Zett., the vector of the rubus stunt virus.
Proc. 10th int. Congr. Ent. 1956, 1958, **3**: 341-5, bibl. 7, reprinted as *Meded. Inst. PlZiekt. Onderz.* **188**.

Macropsis fuscula was shown to be the vector of the rubus stunt virus of raspberries and wild blackberries [see also *H.A.*, 24: 275]. This leafhopper may be controlled by spraying in January or early February with tar oil or DNC, or by two applications, at the end of May and in early June, of parathion (0·1%), malathion (0·2%) or Diazinon (0·1%). In first-year plantations both Systox and parathion reduced the percentage of diseased plants when applied at fortnightly intervals from mid-May to mid-October [see also *H.A.*, 27: 269]. Further experiments with Systox showed that only applications made after August 1 reduced the spread of infection.

3403. DE FLUITER, H. J.
Bladluisbestrijding ter voorkoming van virusverspreiding in aardbeien. **(Aphid control to prevent virus spread in strawberries.)** [English summary 2 pp.]
Reprinted from *Meded. LandbHogesch. Gent*, 1958, **23**: 745-69, bibl. 8.

The degree of virus spread in the field was directly related to the population level of strawberry aphids [see *H.A.*, 27: 2269]. Methyl demeton applications resulted in a longer period of aphid control than did parathion. In a field of virus-free commercial varieties none of the indicator plants showed virus symptoms, although many aphids were present in unsprayed plots. Detailed recommendations are made for aphid control in both propagation and production fields.—Inst. PlZiekt. Onderz., Wageningen.

3404. PIERI, G.
Ulteriori indagini sulla diagnosi della degenerazione infettiva della vite con mezzi colorimetrici. **(Further investigations on the colorimetric determination of infectious degeneration of the vine.)** [English summary 6 lines.]
Ann. Sper. agrar., 1959, **13**: 307-11, bibl. 6.

The author, applying Lindner's method [*Science*, 1948, **107**: 17-9, see *H.A.*, 18: 2552], was unable to confirm the value of the method for identifying infectious degeneration of the vine.

3405. FOGLIANI, G.
Ricerche sperimentali sulla degenerazione infettiva della vite. II, III, IV e V. **(Infestigations on the infectious degeneration of the vine. Parts II-V.)**
Ann. Fac. Agrar. Milano, 1956 (issued 1957), **5**: 59-84, 91-120, 187-215, 217-39.

The whole of this treatise concerns symptoms occurring in diseased vines and vine rootstocks and after transmission by grafting and other vegetative means. Despite this monumental work, clarification of symptoms remains a goal, not an achievement.

Fungi.

(*See also* 3294, 3343, 3374, 3484c, e, h, i, 3485d, g, j.)

3406. SPRAGUE, R.
A world-wide review of the control of bull's eye rots.
Proc. Wash. St. hort. Ass. 1958, pp. 197-8, bibl. 14.

The author briefly summarizes results of work in Tasmania, Nova Scotia and England. He considers that more work is needed on the use of a dormant spray of PMA or other mercurial to reduce inoculum, especially during years when long wet periods follow petal fall.

3407. SHARPLES, R. O.
The response of apple stems to wound infection by *Gloeosporium perennans.*
J. hort. Sci., 1959, **34**: 72-84, bibl. 15, illus.

Anatomical studies on the establishment of infections by *Gloeosporium perennans* on apple branches showed that the defensive mechanism of the host comprised the production of suberized barriers by bark phellogens and the blocking of xylem vessels by gum deposition. These responses followed wounding, whether or not the wounds were inoculated with *G. perennans*, but the response was delayed by the presence of the fungus. The size and form of lesion induced by inoculation was therefore largely determined by the effect of the fungus in postponing the normal process of wound healing. This delaying effect, and consequently the invasiveness of the parasite, was greatest during the period of host dormancy. The progress of invasion was most rapid through the sieve tubes of the phloem and the vessels and fibres of the outer xylem. Longitudinal intercellular spread through the cortex was slower. Intracellular infection of the pith and medullary ray cells occurred in pruning-wound infections. When the progress of the infection had been arrested, the phellogen and cambium laid down barriers of callus tissue consisting of parenchymatous outer cells surrounding a core of wound wood. After the lesion had been thus isolated, the fungus remained alive as a saprophyte and subsequently formed acervuli on the exposed dead host tissue. Exceptionally, a limited spread of infection past the suberized barriers appeared to be effected through the fibre bundles of the inner cortex. [Author's summary.]—Long Ashton Res. Stat., Bristol.

3408. CORKE, A. T. K.
The infection of pruning wounds by *Gloeosporium perennans.*
J. hort. Sci., 1959, **34**: 85-95, bibl. 4, illus.

Inoculations of pruning wounds in apple shoots with *Gloeosporium perennans* showed that, unlike branch wounds, the cut tips of shoots were more or less susceptible to infection with spores throughout the year and that, although the extent of the infection was subject to the same host reactions as operated on lateral branch cankers, the normal healing process might be affected by seasonal conditions. Spore production from infected shoots was found to be greater from November than from March infections and to begin in both instances after one month; July-initiated infections first spored in December and produced very few spores. Like the branch infections studied in 1953-54 [see *H.A.*, 27: 285], the shoot cankers gave considerable numbers of spores in the warm, wet months of December 1956–February 1957. The peak spore collection from the shoot cankers was in the June and July following inoculation, and this was also a peak period for sporulation on the branch cankers. [From author's summary.]—Long Ashton Res. Stat., Bristol.

3409. SHARPLES, R. O.
Further orchard sources of infection by *Gloeosporium* spp.
Plant Path., 1959, **8**: 71-2, bibl. 4, illus.

Saprophytic infections of both *Gloeosporium perennans* and *G. album* on old mummified Cox fruitlets have been found to constitute an economically important orchard source of bitter rot disease. The experimental establishment of leaf scar infections of *G. perennans* is reported.—Long Ashton Res. Stat., Bristol.

3410. OLSSON, K.
Försök med DNOC mot gloeosporium. **(Experiments with DNOC for the control of *Gloeosporium.*)**
Växtskyddsnotiser, 1958, **22**: 80-3, illus.

In the laboratory the growth of *Gloeosporium perennans* spores was checked by low concentrations of DNOC, but when applied as a winter wash in the field DNOC failed to reduce the development of *Gloeosporium* rot in stored apples.

3411. OLSSON, K.
Ett preparat mot svamprötor. **(A preparation for the control fungus rots.)**
Fruktodlaren, 1959, **30**: 83-5.

Stop-Mold B, containing sodium-ortho-phenyl phenate, checked the growth of *Gloeosporium* spores *in vitro*, but failed to control the rot in stored apples when used as a post-harvest dip. This apparent contradiction is explained by the biology of the fungus, and it is suggested that *Gloeosporium* should be controlled on the tree by preventive sprays of captan, ferbam or thiram.

3412. Bondoux, P., and Bulit, J.
Sur la pourriture des pommes due au *Cylindrocarpon mali* (All.) Wr. **(On the apple rot caused by *C. mali*.)**
C.R. Acad. Agric. Fr., 1959, **45**: 275-7.

An eye rot, caused by the conidial form of *Nectria galligena*, is described. Usually the fungicidal treatments for scab control and the eradication of *Nectria* cankers are sufficient to keep the disease in check. Eye rots caused by other fungi are briefly described.

3413. Bulit, J., Louvet, J., and Taris, B.
Étude du pouvoir fongicide de certains dérivés nitrés et chlorés du phénol et du crésol. **(On the fungicidal properties of certain nitro and chloro derivatives of phenol and cresol.)**
Reprinted from *Phytiatrie-Phytopharm.*, 1957[?], **6**: 197-208, bibl. 4.

At concentrations of 100–200 mg./c.c. DNOC and dinoseb had a fungicidal action on *Nectria galligena* without causing any injury to dormant apple trees.—Stat. centr. Path. vég. I.N.R.A., Versailles, and Inst. nat. Agron., Paris.

3414. Kosswig, W.
Bemerkungen zur Biologie und Bekämpfung des Erregers des Apfelmehltaus *Podosphaera leucotricha* (Ell. et Ev.) Salm. **(Observations on the biology and control of the causal organism of apple mildew.)** [English summary 9 lines.]
Z. PflKrankh., 1959, **66**: 263-72, bibl. 8.

Two years' observations on the behaviour of mildew-infected buds on one-year-old shoots of the variety Jonathan showed that: (1) Only the terminal bud is of importance for the overwintering stage of the fungus. (2) Leaf buds are more susceptible than blossom buds. (3) Dead axillary buds are mainly to be found on branches with a dead terminal bud, whilst diseased, developing axillary buds are mainly to be found on branches with a diseased, developing terminal bud. This indicates that there is a relationship between terminal and axillary buds. The interpretation of this relationship will be examined in a subsequent publication. [From author's summary. See also *H.A.*, 29: 1264.]—Inst. PflKrankh., Univ. Bonn.

3415. Kuc, J., and others.
The effect of amino acids on susceptibility of apple varieties to scab.
Phytopathology, 1959, **49**: 313-15, bibl. 4.

The D and DL isomers of phenylalanine markedly increased the resistance of 7 apple varieties to attack by *Venturia inaequalis*. A solution of the amino acid was infused into growing shoots through leaf midribs for a 24-hr period, and leaves above points of infusion were then inoculated with a conidial suspension of *V. inaequalis*. Leaves were examined for the appearance of symptoms 10–21 days after inoculation. The number and size of sporulating lesions were markedly reduced on 5 commercial varieties, Golden Delicious, McIntosh, Jonared, Yellow Transparent and Gallia Beauty infused with D- or DL-phenylalanine. The commercial varieties are susceptible to races 1, 2 and 3 of *V. inaequalis*, and infusion did not result in a resistant reaction, but merely a reduction in the degree of susceptibility. After infusion with D- or DL-phenylalanine, selections of the Russian variety R12740-7A, which is susceptible to race 2 and resistant to races 1 and 3 of *V. inaequalis*, and selections of the variety Geneva, which is susceptible to race 3 and resistant to races 1 and 2, were found resistant to all three races. Small pin-point pits or non-sporulating necrotic or chlorotic areas, typical of a resistant reaction, were evident on these varieties instead of the susceptible reaction. The L, or naturally occurring, isomer of phenylalanine did not alter the disease reaction of the 7 varieties tested. Solutions of D-alanine, DL-α-aminobutyric acid, and, to a lesser degree, D-and DL-leucine, infused only into the Russian variety, had an effect similar to that of D- or DL-phenylalanine; whereas DL- or L-alanine, L-leucine, DL-, D-, or L-tyrosine, DL-, D-, or L-dihydroxyphenylalanine, and DL- or L-cysteine hydrochloride had no effect. [From authors' summary.]—Purdue Univ., Lafayette, Ind.

3416. Hirst, J. M., and Stedman, O. J.
Apple scab.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 105.

Trials indicated the feasibility of forecasting the intensity of the spring liberation of ascospores by estimating the weight of dead foliage remaining in orchards shortly before bud-burst. The weight of dead foliage would have to be related to the ascospore productivity, estimated either by artificially accelerating the maturation of perithecia, or indirectly through regression of the percentage of leaves infected in autumn on the subsequent ascospore productivity of samples of the same leaves the next spring. Leaves formed in July and August on unsprayed Laxton's Superb were more heavily infected than those formed in May and June, and the first leaves to fall in autumn produced fewer ascospores than those falling later.

3417. Powell, D.
The evaluation of fungicides for the control of apple scab, 1958.
Trans. Ill. St. hort. Soc. 1958, 1959, **92**: 70-4.

Leaves of unsprayed trees of Jonathan, Golden Delicious and Delicious showed 100% scab infection. Cyprex gave excellent scab control at ½ and ¾ lb./100 gal. [see also *H.A.*, 28: 2355], and Fungicide 23441 (65% dodecylguanidine acid phthalate) was equally effective. Fungicide 23281 (65% docecylguanidine borate) was less effective than these two compounds. Phaltan (50% at 2 lb.), Orthocide (80% at 1½ lb.) and captan (50% at 2 lb.) were equally effective for scab control. Promising new materials were Thioneb at 4 lb., T.D. 22 (composition not revealed) at 2 lb., General Chemical 2466 (mucochloric anhydride) at 2 lb., and CP 14601 (50% trichloromethyl N-acetylthiosulphanilate) at 4 lb., but CP 14601 did not control leaf infection and caused a slight fruit russet.—Ill. agric Exp. Stat., Urbana.

3418. Clayton, C. N.
Report on new apple fungicides.
Res. and Fmg N.C., 1959, **17**(3): 6, illus.

Among fungicides compared with captan, Cyprex has given outstanding control of apple scab but has not controlled bitter rot; moreover, it caused russeting on Golden Delicious and was not very effective against rusts or powdery mildew. In preliminary trials Phaltan also performed well against scab, and in addition gave better control than any other fungicide tested of bitter rot and other fruit rots.

3419. Heyns, A. J.
Is it possible to eradicate *Fusicladium* of apples?
Dec. Fruit Gr, 1959, **9**: 70-2, illus.

In preliminary trials in the Western Province of South Africa the post-harvest application of phenyl mercuric chloride has reduced scab infection the following year by eradicating the overwintering source of infection [see also *H.A.*, 26: 376 and 28: 3483].

3420. (New Zealand Department of Agriculture, Horticulture Division.)
Black spot trials.
Orchard. N.Z., 1959, **32**: 83.

In 2 years' comparative trials, PMC gave significant control of scab on Delicious apples when applied at 5 lb./100 gal. just before leaf fall.

3421. Daines, R. H.
Advises bordeaux-arsenic mixture for peach canker.
N.J. Agric., 1959, **41**(2): 13-16, illus.

Spray applications at the silver bud stage (when a few buds were just showing pink) gave more complete control of peach canker than applications made 4 days later. Good control of spring canker infections was given by bordeaux (4 : 6 : 100) plus 3 lb. monocalcium arsenite or 3 lb. lead arsenate, plus 1½ pints of spray oil. Delay in spraying until the "balloon" stage can seriously reduce fruit setting. This spray should be followed by wettable sulphur (6 lb. in 100 gal.) at weekly intervals until shuck [calyx] fall.

3422. (Hutton, K. E.)
Control of shot hole in stone fruits.
Commonw. phytopath. News, 1959, **5**: 27.

Single sprays of 0·1% phenyl mercuric chloride in late autumn or early winter have largely controlled shot hole, *Clasterosporium carpophilum*, in almond, apricot and peach in New South Wales.

3423. Martelli, G. P., Salerno, M., and Ciccarone, A.
Prove di lotta primaverile contro i funghi delle perforazioni fogliari del mandorlo in Sicilia. **(Tests on the spring control of shot-hole fungus of almonds in Sicily.)**
Not. Mal. Piante, 1959, Nos. 47/48, pp. 231-7, bibl. 3, illus.

Bordeaux applied at 1% in winter was unsuccessful. Zineb (0·3% Aspor), zineb + glycerine (1%), and captan (0·3% Orthocide 50) sprays applied during March to May near Syracuse all significantly reduced leaf spot diseases due to *Coryneum beijerinckii* and *Cercospora circumscissa on* almonds. The zineb sprays induced a non-significant increase in crop; captan and glycerine were slightly phytotoxic.

3424. Ogawa, J. M., Wilson, E. E., and English, H.
The leaf blight disease of almond and its control.
Hilgardia, 1959, **28**: 239-54, bibl. 8, illus.

The causal organism of a leaf blight, first observed in almonds in the Sacramento and San Joaquin valleys of California in 1950, has been identified as *Hendersonia rubi*. The etiology of the disease and the life history of the fungus are described. Control has been obtained by spraying in late winter with sodium pentachlorophenoxide or N-phenylmercuri-ethylenediamine, or, at petal fall, with captan, dichlone or ziram.—Univ. Calif., Davis.

3425. Graves, C. H., Jr.
Contact fungicides as late dormant sprays for pecan scab control.
From abstr. in *Phytopathology*, 1959, **49**: 317.

The following 4 spray materials were tested over 2 years in an attempt to eliminate the main source of overwintering scab inoculum (the holdover stromata on infected twigs): Santobrite (sodium pentachlorophenate), Corona CM-220 (mono-calcium meta-arsenite), Puratized Agricultural Spray (phenylmercuritriethanol ammonium lactate) and Puratized Apple Spray (phenylmercurimono-ethanol ammonium acetate). The 2 last-mentioned compounds, at 5 pints per 100 gal., consistently gave the best results, followed by Santobrite at 4 lb. per 100 gal. In order to obtain a significant disease decrease at midseason, it was necessary to follow the dormant spray with regular early-season sprays.

3426. Aspitarte, T. R.
Availability of nitrogen in ammoniated bark used as a soil amendment.
Diss. Abstr., 1959, **19**: 3084-5, being *L.C. Card No. Mic.* 59-1704 of 114 pp.

Additions of ammoniated Douglas-fir bark residues and non-ammoniated hot water-extracted bark at 100 tons per acre to a soil mixture infested with *Phytophthora fragariae* reduced the incidence of red core disease in strawberries by about 83%.—Ore. St. Coll.

3427. Müller, H. W. K.
Zum Auftreten und zur Bekämpfung des Erdbeermehltaues (*Sphaerotheca humuli* [DC.] Burr.) und der Erdbeergraufäule (*Botrytis cinerea* Pers.), 2. Beitrag. **(On the incidence and control of mildew and grey mould on strawberries, 2nd communication.)** [English summary ¼ p.]
NachrBl. dtsch. PflSchDienst., Braunschweig, 1959, **11**: 97-102, bibl. 12, illus.

Earlier work [see *H.A.*, 27: 3286] had shown that the best control of mildew and grey mould on strawberries was given by 3 treatments with TMTD + sulphur (including one during the fruiting stage). In further extensive tests TMTD + sulphur caused an excessive deterioration in flavour of fresh and processed strawberries. The use of DPTD + Karathane, which had little effect on flavour, is therefore recommended; the sprays should be applied at the beginning and end of the main flowering period and only in cases of need at the green fruit stage.—Staatsinst. angew. Bot., Hamburg.

3428. Miller, P. M., and Stoddard, E. M.
Control of gray mold on strawberries.
Abstr. in *Phytopathology*, 1959, **49**: 228.

At the first picking, quadruplicated 10-ft. plots of Stelemaster strawberries averaged 109, 89, and 39 *Botrytis-cinerea*-infected berries, respectively, when sprayed 1, 2, or 3 times with Dichlone (50%) ⅜ lb./100 gal. Similar plots averaged 115, 63, and 26 infected berries, respectively, when sprayed 1, 2, or 3 times with thiram (65%) 3 lb./100 gal. Plots sprayed 3 times with captan (50%) 6 lb./100 gal. averaged 55 infected berries, and the unsprayed plots averaged 93 infected berries. Counts were made 14 days after the third application. Comparing only fruit sprayed 3 times, the least gray mold developed on the harvested fruit from thiram plots both 1 and 4 days after picking. Differences among treatments were less on the fourth day and also 1 day after the next picking, 7 days after the first. Sparkle berries sprayed 5 times with thiram, dichlone, or captan ranked in the same order as in the Stelemaster plots. Again the differences were greater in the first picking and less evident at another picking 8 days later. Sprays did not lower yields of either variety. All sprayed Stelemaster plots yielded approximately 5,000 g. per 10-ft. plot, and unsprayed plots yielded 4,000 g. per 10-ft. plot.

2429. Tapio, E.
Mansikan harmaahome. **(Grey mould of strawberry.)** [English summary 5 lines.]
Puutarha, 1959, **62**: 270, illus.

Soft strawberry varieties, such as Ydun, Freya, Deutsch Evern, Bliss and Rubin, proved highly susceptible to *Botrytis cinerea* in Finnish trials. The bitter flavour given to the fruit by captan sprays persisted in jams and canned products, and treated fruit was dull in colour. These defects did not appear after spraying with thiram.

3430. Uitterlinden, L.
Vruchtrot in rode bessen. **(Fruit rot of red currants.)**
Fruitteelt, 1959, **49**: 493.

Red currant varieties, the fruit of which are susceptible to *Botrytis* attack, were protected by 3 sprays of 0·5% TMTD applied at intervals of 10–14 days beginning at the start of flowering.—R.T.C., Barendrecht.

3431. Czufin, L. F.
Captan stops mold.
West. Fruit Gr, 1959, **13**(6): 31, illus.

Decay of stored grapes due to *Botrytis cinerea* was controlled by 4 applications of 5% captan dust at 25 lb./acre, given on July 1, August 1, September 1 and immediately after the first harvest-period rain.

3432. Baldacci, E., and Refatti, E.
La lotta contro le due maggiori ampelopatie: peronospora (*Plasmopara viticola*) e oidio (*Uncinula necator*) in relazione alla conoscenza dei periodi di incubazione e dei cicli biologici. I e II. **(The control of the two main vine diseases, the downy and powdery mildews, in relation to their incubation periods and biologies. Part I and II.)** [English summary 1 p.]
Ann. Fac. Agrar. Milano, 1956 (issued 1957), **5**: 35-57, bibl. 9, and 151-78, bibl. 27.

These two articles are almost exclusively concerned with downy mildew. The authors, from their own observations and from the data collected at various centres during in the years 1950–55, confirm the conditions necessary for primary infection, namely a minimum air temperature of 10° C. [50° F.] for some days, at least 10 mm. rain in 24 hours, young branches with leaves measuring 6 or 9 sq. cm., and oospores ready to germinate. The dates of the first appearance of the disease in the district in question were generally rather later than the incidence of the above conditions would have led one to expect. If, however, growers were to follow the instructions of the warning calendar issued yearly, they might sometimes have been premature, but they would never have been too late. In the 6 years studied a comparison of the weather in the period April 15–July 31 shows heavy rains in 1953 and 1954 with bad outbreaks of mildew, and but little rain in the years of mild outbreaks, except in 1951 when rain was abundant but there was little mildew. Attacks seem to be extending into the late summer and autumn months, a fact which indicates the advisability of continuing control measures beyond mid-July.

3433. LAFON, J., COUILLAUD, P., AND GAY-BELLILE, F.
La pulvérisation pneumatique à fort débit d'air et à faible débit de liquide dans la lutte contre le mildiou de la vigne. (**Concentrate spraying for the control of vine mildew.**)
Progr. agric. vitic., 1959, **151**: 240-5, bibl. 8, illus., 267-71, bibl. 2, and 291-8, illus.

The principles, advantages and disadvantages of high-volume and concentrate mist spraying are discussed. In a vineyard trial all of the misted spray materials tested gave better mildew control than 2% bordeaux applied at high volume, and droplet distribution was much more even than with high-volume application. The persistence of copper sprays applied in autumn by misting was poor in southern vineyards. The results of mist spraying are regarded as encouraging, but further regional tests are required.—Stat. vitic., Cognac.

3434. GARGIULO, A. A.
Efectos secundarios de productos cúpricos y acúpricos utilizados para controlar *Plasmopara viticola*. (**Side effects of copper and non-copper products used for control of *Plasmapara viticola*.**) [English summary 8 lines.]
Rev. Invest. agríc. B. Aires, 1958, **12**: 379-95, bibl. 45.

Yields were increased by controlling downy mildew of vines with zineb (3·5 g./l. of a 75%-active product) or, to a lesser extent, with captan (2·5 g./l. of 50%-active) compared with the use of 1·5% slightly alkaline bordeaux. The yield increase from maneb-treated vines was insignificant. Practically equal yields from unsprayed and bordeaux-treated plants showed that bordeaux did not materially obstruct photosynthesis.

3435. GÄRTEL, W.
Beobachtungen über den Einfluss der Kaliumernährung auf das Auftreten von Oidium bei Amerikaner-reben. (**Observations on the effect of potassium manuring on the incidence of oidium on American vines.**)
Reprinted from *Weinberg u. Keller*, 1959, **6**: 81-5, bibl. 7.

In the case of the *berlandieri* × *riparia* hybrids 5C and 5BB a linear correlation was shown to exist between the degree of injury resulting from potassium deficiency and the incidence of oidium. Leaf blades and internodes were increasingly more subject to infection as the symptoms of potassium deficiency became more severe. An adequate supply of potassium was found to reduce the incidence of oidium to a minimum.—Inst. f. Rebenkrankh., Bernkastel-Kues/Mosel.

Nematodes.

(*See also* 3387, 3484w, 4162f.)

3436. PITCHER, R. S.
The chemical control of leaf and bud eelworms (*Aphelenchoides* spp.) and stem and bulb eelworm (*Ditylenchus dipsaci*) on strawberries.
J. hort. Sci., 1959, **34**: 61-71, bibl. 13.

An account is given of preliminary laboratory testing of a number of substances as nematicides, using the eelworm *Aphelenchoides ritzema-bosi* as a test organism, and of extensive field testing of parathion against this species and *A. fragariae* and *Ditylenchus dipsaci* on strawberries. With each species the level of infestation was greatly reduced by parathion, whether used as a soil drench, a spray or a pre-planting dip; with *Aphelenchoides* spp. symptoms gradually reappeared over a 3-year period. Of the control measures tested, a pre-planting dip in parathion at 0·1% active ingredient gave the best results. [From author's summary.]—East Malling Res. Stat., Kent.

Mites.

(*See also* 3448, 3450, 3454, 3458, 3484j,s, 3485a,b,m.)

3437. ASCHERSLEBEN, INSTITUTE OF PHYTOPATHOLOGY (KLINKOWSKI, M., AND OTHERS.)
Tagungsberichte Nr. 17. Spinnmilben. Symposium des Instituts für Phytopathologie Aschersleben am 9. und 10. Juli 1957. (**Proceedings No. 17. Spider mites. Symposium of the Institute of Phytopathology, Aschersleben, held in July, 1957.**)
Deutsche Akademie der Landwirtschaftswissenschaften, Berlin, 1958, pp. 112, bibls, illus.

Eight papers are published here, of which five deal with ecological and physiological subjects and three with acaricides and control, with special reference to orchards. Russian and English summaries are provided.

3438. VAN DE VRIE, M., AND DE FLUITER, H. J.
Some observations on the effect of insecticides and acaricides on the population of the European red spider mite (*Metatetranychus ulmi* Koch) and its principal predators in commercial orchards in the Netherlands.
Proc. 10th int. Congr. Ent., 1956, 1958, **3**: 603-6, bibl. 4, reprinted as *Meded. Inst. PlZiekt. Onderz.* **190**.

In apple orchards the application of chlorbenside with or without DDT was followed by a decline in the egg and mite populations of red spider, and then by a decline in the population of the predatory bugs *Anthocoris nemorum* and *Orius minutus*. Populations of beneficial *Typhlodromus* mites. however, were hardly affected. Applications of parathion plus chlorbenside or ovotran (PCPCBS) gave excellent control of red spider mite, but almost all predatory mites and bugs were destroyed. On untreated trees the spider mite population reached a high level in 1955 in spite of the presence of predators. When the mite population decreased because of lack of food, the predatory bug population decreased too, but *Typhlodromus* species were hardly affected.—I.P.O., Wageningen.

3439. MEYER, R. H.
Mite control trials during early season on several apple varieties.
Trans. Ill. St. hort. Soc. 1958, 1959, **92**: 105-13, bibl. 2.

Only Chipman R-6199 (O,O-diethyl S-(2-diethylamino) ethyl phosphorothiolate hydrogen oxalate) gave satisfactory control of European red mite (*Panonychus ulmi*) on all plots in tests with 8 materials applied to 4 varieties.

3440. FULLMER, O. H., KURTZ, E. A., AND CASSIL, C. C.
A new material for the control of pear leaf blister mite.
J. econ. Ent., 1959, **52**: 183-5, bibl. 6, illus.

Phostex, bis (dialkyloxyphosphinothioyl) disulfides, where the alkyl groups are ethyl and 2-propyl in a ratio of three to one, is a phosphate insecticide-acaricide of low mammalian toxicity. It has given excellent control of the pear leaf blister mite, *Eriophyes pyri*, on pears during 2 years of development and 1 year of commercial use. No injury was detected on pears when Phostex emulsifiable concentrate was used alone after harvest or at the delayed dormant stage, or when it was used in combination with oil during the dormant period. Phytotoxicity has been observed where Phostex was applied to the foliage of most stone fruits; however, no injury to these trees has been observed with dormant sprays of Phostex-oil combinations. [From authors' abstract.] The material has also shown effectiveness against many other tree fruit pests.—Niagara chem. Div., Food Machinery chem. Corp., Richmond, Calif.

3441. POPOVA, M. P.
Control of currant bud mite. [Russian.]
Sad i Ogorod, 1959, No. 3, pp. 53-4.

Instead of lime-sulphur, which is inconvenient to prepare, colloidal sulphur in DDT was applied for the control of bud mite [*Phytoptus ribis*] on blackcurrants. A 1% suspension of colloidal sulphur in DDT applied at the beginning of mite emergence from the buds (during the opening of the 3rd leaf), followed by a second treatment 10 days later, gave the greatest reduction in bud injury.

3442. VAN LIER, P.
Rondknopbestrijding bij zwarte bessen. **(Control of big bud of black currants.)**
FLIERMAN, J.
Rondknop in zwarte bessen. **(Big bud of black currants.)**
Fruitteelt, 1959, **49**: 458-9, 512.

In Horst (Limburg) sulphur materials were the best of several tested for big bud control on Goliath, but there was a risk of phytotoxicity. Thiodan was safer but less effective.
In Hoorn (Noord-Holland) results showed low-volume sprays of endrin and thiodan to give the best control of big bud.

3443. PHILIPP, W.
Blausäure gegen Johannisbeergallmilbe (*Eriophyes ribis* Nal.). **(Hydrocyanic acid against the gall mite of black currants.)**
Z. PflKrankh., 1959, **66**: 353-4.

Fumigation of black currant bushes with HCN (10 g./cu.m.) killed *Phytoptus ribis* in the galls within 30 minutes.—Landesanst. f. PflSchutz, Bezirksstelle Heidelberg.

3444. SUNCOVA, M. P.
The effect of the osmotic pressure of the cell sap on susceptibility to bud mite injury of black currants. [Russian.]
Zap. Leningr. s-h. In-ta, 1956, No. 11, pp. 171-8, from *Ref. Ž.* (*Biol.*), 1958, No. 7, Abstr. 30,056.

Work at the Leningrad Agricultural Institute showed that many European black currant varieties are highly susceptible to the black currant bud mite [*Phytoptus ribis*], but Altai varieties, their hybrids and the European Laxton are resistant. The higher the osmotic pressure of the cell sap the greater was resistance [see also *H.A.*, 28: 299]. Increased rates of mineral fertilizers gave a 2½–3-fold reduction in the percentage of bud injury.

3445. FRENCH, N.
Control of the gooseberry red spider mite on gooseberry.
Plant Path., 1959, **8**: 45-6, bibl. 6.

Excellent control of *Bryobia praetiosa* for the entire season may be obtained by a single spring application of a 5% DNC petroleum wash. The spray should be applied as early as possible after the winter eggs have hatched.—N.A.A.S., Newcastle.

3446. KALMYKOVA, A. M.
A trial on the control of strawberry mite. [Russian.]
Sad i Ogorod, 1959, No. 3, pp. 55-6.

Treatment of strawberry runners for 13–14 min. in hot water at 46° C., to which heteroauxin or indolylbutyric acid at 5 g./100 l. was added, gave very good control.

Insect pests.

(*See also* 3350, 3376d, 3483, 3484b, f, l, x, z, 3485f, i, n, 4162c.)

3447. Sebbel, H.
The importance of winter sprays and the application of Folidol-oil.
Höfchen-Briefe (English edition), 1958, **11**: 129-31.

Pre-blossom sprays of Folidol-oil [containing parathion] were equally effective for insect control on fruit trees as a winter spray of dinitrocarbolineum. With treatment at the mouse-ear stage, neither small leaves nor buds were injured.—Orchard. adv. Org., Seestermühe.

3448. Meyer, R. H.
Grower insecticide trials, 1958.
Trans. Ill. St. hort. Soc. 1958, 1959, **92**: 98-105.

In growers' trials in apple orchards Sevin and Guthion generally gave increased insect control over the regular spray schedules (i.e. DDT and parathion or malathion with early applications of lead arsenate, and TDE or dieldrin for leaf rollers or curculios). Guthion gave excellent mite control, but mites were more numerous in Sevin plots than in those given regular spray schedules.

3449. Watanabe, T.
Experiments on non-bagged fruits of early peaches. [Japanese, with English summary 16 lines.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 26-31.

A long term trial of chemical methods of preventing insect damage to unbagged fruits showed that 4–5 sprays of Folidol emulsion from mid-May to mid-June gave adequate protection. EPN, Diazinon and Dipterex were as effective as Folidol, but their residues were less stable.

3450. Alkan, B.
Haselnussschädlinge in der Türkei. **(Hazelnut pests in Turkey.)** [English summary 16 lines.]
Z. angew. Ent., 1959, **44**: 187-202, bibl. 18, illus.

Hazel nuts are a valuable source of foreign exchange in Turkey where they are grown chiefly in the province of Giresun on the Black Sea coast. The most important pests are *Eriophyes avellanae*, *Balaninus nucum*, *Xyleborus dispar*, *Melolontha melolontha* and *Polyphylla fullo*. *E. avellanae* causes considerable damage by destroying the flowers and flower buds. Effective control was obtained by dusting with 4 kg. sulphur per 1000 sq. m. in spring during the migration period. *Balaninus nucum*, the worst enemy of hazel nuts, has been successfully suppressed by preparations of DDT, BHC, lindane and heptachlor. The larvae of *M. melolontha* and *P. fullo* were also controlled by BHC and lindane dusts, but so far no chemical has proved adequate for the control of scolytids. In this case the burning of affected branches and trunks is recommended. The young stages of *X. dispar* were killed by DDT. Lepidopterous and coleopterous storage pests are also described and their control is discussed.—Inst. PflSchutz, Univ. Ankara.

3451. Evenhuis, H. H.
Effect van insekticiden op de bloedluisparasiet *Aphelinus mali.* **(The effect of insecticides on the woolly aphid parasite, *Aphelinus mali*.)** [English summary 9 lines.]
Meded. Dir. Tuinb., 1959, **22**: 306-11, bibl. 3, illus.

Sprays of DDT, BHC, Diazinon and thiodan hardly affected *Aphelinus mali* in the various stages of development which occurred within the mummified hosts. Parathion and malathion sprays, however, caused high mortality, particularly to the late pupal stage. Adult dormant parasites were not susceptible to insecticides.—I.P.O., Wageningen.

3452. Michelbacher, A. E., and Burdick, D. J.
Walnut aphid investigations.
Calif. Agric., 1959, **13**(3): 10.

At 3 sites in California a single spray of OMPA [schradan] at concentrations between 0·5 and 1·1 lb. per acre was most satisfactory for controlling the walnut aphid [*Chromaphis juglandicola*]. OMPA is now registered with the U.S.D.A. for use on walnuts, and good control has followed treatment in the period from the feather stage of developing nuts until the average cross-sectional diameter reaches ⅜ to ½ in. Control was disappointing when OMPA was applied after the foliage had hardened. Another promising spray programme is BHC for early season aphid control, followed by Systox or another aphicide; Trithion, ethion and Phosdrin have all given good aphid control. Results with sevin and guthion were not very satisfactory.

3453. Eide, P. M.
New weevil appears among strawberries.
Bett. Fruit, 1959, **53**(10): 9, 17.

The woods weevil, *Nemocestes incomptus*, may be controlled by inter-row fumigation with EDB. The lowest effective dosage is 1 c.c. of 85% EDB per foot of row [see also *H.A.*, 29: 2334].—Northw. Wash. Exp. Stat., Mount Vernon.

3454. Barnes, M. M., and Ortega, J. C.
Experiments with protein hydrolysate bait sprays for control of the walnut husk fly.
J. econ. Ent., 1959, **52**: 279-85, bibl. 5.

A controlled corn-protein hydrolysate, Staley's Protein Insecticide Bait No. 7, was shown to be the most attractive of the materials tried as attractive components of toxic bait sprays for experimental use in control of the walnut husk fly (*Rhagoletis completa*). Malathion wettable powder proved superior to technical Dipterex as a toxic component. Bait sprays were compared with standard full-coverage sprays of malathion (without attractant) for area control of adults. Comparison of treatments showed that bait-type spray coverage without the protein hydrolysate attractant strongly depressed fly populations for 5 to 7 days, and with the attractant, for 12 days. Standard full-coverage sprays (using twice the amount of malathion) depressed fly populations for 9 to 11 days. Very good control of the walnut husk fly resulted from two bait sprays or from standard full-coverage treatments spaced at a 25-day interval. Bait sprays, however, were observed to result in high populations of *Tetranychus cinnabarinus* on Placentia and Payne walnut varieties during the second year of trial, but not in blocks of Eurekas. [From authors' obstract.]—Univ. Calif., Riverside.

3455. De Pietri-Tonelli, P.
Due minatori delle foglie di melo: nepticula e cemiostoma. **(Two apple leaf miners: *Stigmella* sp. and *Leucoptera* sp.)**
Inf. fitopat., 1959, **9**: 78-80, illus.

Stigmella (*Nepticula*) *malella* has been satisfactorily controlled in field trials by 0·03% parathion, applied before the first-generation larvae emerged from the leaves, and again 7–8 days later. *Leucoptera* (*Cemiostoma*) *scitella* pupae can be destroyed by winter sprays of oil, or of parathion with or without oil. Good results were obtained by spraying in spring, when the first foliar lesions had reached 0·5 cm. in a diameter, with 0·03% parathion, repeating the treatment after 10–12 days.

3456. d'Aguilar, J.
Remarques préliminaires sur la pullulation d'une mineuse des feuilles de pommier (*Stigmella malella* STT.) dans la région parisienne. **(Preliminary observations on the rapid multiplication of an apple leaf miner (*S. malella*) in the Paris area.)**
C.R. Acad. Agric. Fr., 1959, **45**: 213-15, bibl. 6.

The life history is described. Control is difficult, and insecticide applications to the tree have destroyed the natural predators of the pest. The application of insecticidal dust to the soil in spring to control first generation adults is recommended, together with the destruction or treatment of mulching material which harbours pupae.

3457. Labruyère, R. E., and Nijveldt, W. C.
Stengelziekte en stengelsterfte bij de framboos. **(Cane blight and die-back of raspberry.)** [English summary 1 p.]
Meded. Dir. Tuinb., 1959, **22**: 168-76, bibl. 7, illus.

Cane die-back (or midge blight), a result of gall midge (*Thomasiniana theobaldi*) attack with secondary fungal infection, was effectively reduced by removing all the new canes in the first week of May, and so preventing oviposition during the first flight period. Canes which developed later were thinned. Parathion (0·1%) sprays were also effective against the larvae when applied at weekly intervals from the start of midge infestation.—I.P.O., Wageningen.

3458. Asquith, D.
Apples. DDT no miracle killer.
Amer. Fruit Gr, 1959, **79**(2): 18, 22, illus.

Applications of Sevin, Guthion, and Guthion plus DDT gave 96–99% control of codling moth on apples, while control with DDT was 64%. Mite populations were high on Sevin-sprayed trees, and, at 2 lb. per 100 gal., 50% Sevin w.p. russeted Golden Delicious fruits. A mixture of 0·5 lb. 25% Guthion with 0·5 lb. 50% Sevin per 100 gal. gave excellent control (99%) of codling moth, with less russeting and increase in mite populations.—Pa St. Univ., Arendtsville.

3459. Madsen, H. F.
Cooperative plots combat codling moth.
West. Fruit Gr, 1959, **13**(4): 25-6, illus.

In trials throughout 6 counties Guthion gave excellent control of codling moth on pears, as well as of pear psylla, aphids and spider mites. Sevin was equal to DDT in some cases and superior in others; control by ethion was least effective. [See also *H.A.*, 29: 1297.]—Univ. Calif., Berkeley.

3460. Sylvén, E.
Fruktbladvecklare på äpple. **(Fruit leaf tortricids on apples.)**
Växtskyddsnotiser, 1958, **22**: 84-93, illus.

The paper describes work carried out at Åkarp on the biology and control of certain species of the following genera of fruit leaf tortricids on apples: *Acleris*, *Cacoecia*, *Pandemis*, *Argyroploce*, *Acroclita* and *Spilonota*. In spring, when the trees are in the mouse-ear stage, spraying should be carried out with parathion or malathion. In summer 3 treatments are recommended with malathion or phosphoric acid esters, namely: (1) at the time of the maximum emergence of *Cacoecia podana*, (2) 2–3 weeks later, and (3) 5–6 weeks after the first summer treatment. A light trap is described, the use of which would make a warning service possible.

3461. de Jong, D. J.
Heggebladrollers en Phosdrin. **(*Cacoecia rosana* and Phosdrin.)**
Fruitteelt, 1959, **49**: 645.

Living caterpillars of the tortrix *Cacoecia rosana* were found in only 21% of the rolled leaves of apple trees after the application of 0·05% Phosdrin. After demeton treatment there were living caterpillars in 92% of the rolled leaves.—Proefst. Fruit. Volle Grond, Wilhelminadorp.

3462. Wylie, W. D.
Control of the peach tree borer, *Sanninoidea exitiosa,* Say.
Bull. Ark. agric. Exp. Stat. **599**, 1958, pp. 24, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-316.

A single application (between May 20 and June 1) of dieldrin (6–12 lb. 50% wettable powder) [see also *H.A.*, 27: 332] or of BHC (10 lb. 12% γ-isomer per 100 gal.) to the trunks of peach trees, up to a height of 8–12 in., effectively controlled the peach tree borer. [For a description of the trunk sprayer see abstract 3483.] Soil fumigation with *p*-dichlorobenzene (1 oz. per tree on top of the soil) in the autumn effectively controlled borers already in the tree.

3463. Bibolini, C.
Danni causati al pesco e al susino da *Gastropacha quercifolia* L. (Lep.-Lasiocamp.). **(Damage on peach and plum trees due to *Gastropacha quercifolia.*)**
Riv. Ortoflorofruttic. ital., 1959, **43**: 65-73, illus.

Observations are made on recent damage done to flower buds and leaves. Lead arsenate spraying 3 or 4 days before blossoming is advised, but the advice is not based on experiments.

3464. Batinica, J., and Tafro, A.
Pojava šljivinog savijaca (*Laspeyresia funebrana* Tr.) na području Sarajeva i mogućnosti njegovog suzbijanja. **(The occurrence of plum fruit moth in the Sarajevo district and possibilities of its control.)** [French summary 1 p.]
Rad. Poljopriv. Šumarskog Fak. Sarajevo, 1958, **7**(9): 25-34, bibl. 8.

In 1956 a spray of 0·15% Lindapin applied on 30 July gave the best results, reducing caterpillar infestation by 50%. In 1957 Bentox (0·4%) gave the best results (74% reduction of infestation) when applied on 10 July and 5 August.

3465. Retan, A. H., Post, G. R., and Michelbacher, A. E.
Filbertworm control.
Calif. Agric., 1959, **13**(7): 13.

In the second year of control trials in walnut orchards [for earlier work see *H.A.*, 28: 2428] Guthion (25% w.p.) was applied at 6·5 lb. per acre and Sevin (50% w.p.) at 8 lb. per acre on August 20. Infestation of Payne nuts by filbertworms [*Melissopus latiferreanus*] was reduced from 22% to 7·6% and 10·2%, while on Franquettes it was reduced from 9·6% to 2·4% and 4·5%, by Guthion and Sevin respectively. Better results might be obtained with higher concentrations of insecticides.

3466. Roesler, R.
Experience with Folidol oil spray against brown scale (*Eulecanium corni* Bche.) on grape vines.
Höfchen-Briefe (English edition), 1958, **11**: 121-3.

In vineyard tests in the spring of 1957, Folidol oil spray [containing parathion] was the best of the materials tested against brown scale, giving 96·5% control in July (leaf count). In further tests in 1958 scale control varied from 96·8% with Folidol to 99·6% with DNC 1%. Results were better than in the previous year, which is attributed to a later spraying date and to wetter weather.—Res. Inst. Vitic. Hortic., Neustadt.

3467. Michelbacher, A. E., McKenzie, H. L., and Gonzales, C. Q.
Soft scales infesting walnut.
Calif. Agric., 1959, **13**(5): 6, 13, illus.

High scale populations in a test plot receiving DDT, BHC and Systox were reduced to a very low level by an oil/parathion spray applied in November, but increased to a destructive level again within 2 years. The application in July or August of parathion (25% w.p. at 2–3 lb.) plus summer oil ($\frac{3}{4}$ gal.) in 100–200 gal. water per acre has given excellent control of scale populations. Malathion, Trithion, ethion and Guthion have also given promising results. Parathion/oil sprays may also be applied from mid-December to February while the trees are dormant.

Other pests.

(*See also* 3484o, y, 3563, 3564, 3723i.)

3468. Bender, —.
Knospenfrass. **(The destruction of buds by birds.)**
Bad. Obst- u. Gartenb., 1959, **52**: 70, from abstr. in *Beerenobstschrift.*, 1959, No. 14, p. 10.

Spraying red currants with 1% water glass in December and January produced a film over the flower buds and prevented damage by birds.

3469. Švanderov, F. A.
Rodent damage to gooseberries and strawberries. [Russian.]
Priroda, 1959, **48**(5): 110-11, illus.

In Gorki, during the winter of 1956–1957, serious injury was caused by mice to the gooseberry variety Finik Zelenyj [Green Date], under which the fallen leaves had accumulated. Strawberries under deep snow were also attacked, especially those on slopes. Nests were found under both crops. For the prevention of damage to gooseberries the removal of plant debris, setting poison baits and dusting the soil under the bushes with BHC are recommended.

3470. (DILLER, J. D.)
The tin-can method for protecting chestnut seedbeds from rodents.
49th A.R. north. Nut Grs' Ass. 1958, Beltsville, Md, pp. 44-6.

Chestnut seeds and seedlings were protected in the seed-bed from rodents, which are apt to cause serious damage, by planting the seeds singly in 1-quart oil cans buried in the soil. Each seed-bed was surrounded by a wall of ½-in. mesh "hardware cloth" about 21 inches high and buried about 3 inches deep, and also covered completely by another strip of ½-in. mesh "hardware cloth".—Forest Serv., U.S.D.A.

Chemicals and their application.

(*See also* 3484g, m, p, r, 3485c, 3562, 4057.)

3471. SMITH, C. N. (CHAIRMAN, COMMITTEE ON INSECTICIDE TERMINOLOGY).
Common names of insecticides.
J. econ. Ent., 1959, **52**: 361-2.

This revised list of common names is confined to the principal organic compounds that have been developed in recent years, the chemical names of which are too long for convenient use.

3472. NEWCOMER, E. J.
Fruit insect control.
Proc. Wash. St. hort. Ass. 1958, pp. 119-20.

The writer discusses some new approaches to pest control. One possibility is the use of silica gel as a drying agent. It has such an affinity for moisture that it dries an insect up and thus kills it. It is harmless to plants and mammals, and has already been found effective against fruit tree mites. [For description of applicator see abstr. 3482.] Another is the use of hormones to cause insects to commit suicide. They may even be selective among insects, and should be harmless to all except insects. Briefly they cause the insect to moult prematurely, and the result is death.

3473. HARD, M. M., AND ROSS, E.
Flavor changes of some fruits and vegetables treated with pesticides.
J. agric. Food Chem., 1959, 7: 434-5, bibl. 11.

Flavour differences were detected in raw apples treated before harvest with a methoxychlor/Chlorobenzilate mixture and with Guthion, compared with untreated fruit. Differences caused by the former were no longer apparent in the canned product, but canned apple juice from fruit treated with demeton showed differences. The flavour of Chlorobenzilate-treated canned peaches was different from that of the controls. Strawberries and raspberries also showed flavour differences due to pesticide treatment, but no sample was unacceptable. Effects on other products, reported in the literature, are discussed.

3474. BISHOP, R. F., CHISHOLM, D., AND PATTERSON, N. A.
Arsenical residues on the fruit and foliage of apple trees.
A.R. N. Scotia Fruit Grs' Ass. 1958, pp. 81-5.

There is a very marked and rapid decrease in arsenical deposits on foliage during the initial 2- to 3-week period following the final spray. Both time and rate of application are important factors in the magnitude of arsenical residues on fruit and foliage, and, in general, the higher the rate and the later in the season spray is applied, the greater the residues. Differences in results obtained in 1957 and 1958 suggest that rainfall during July, August and September may have an important bearing on the magnitude of arsenical residues on fruit. [Authors' conclusions.]—Sci. Serv. Lab., Kentville, N.S.

3475. GRY, J., AND OTHERS.
Les journées françaises d'études et d'information sur les fongicides agricoles. **(Days devoted to studies and information on agricultural fungicides in France.)**
Agron. trop., 1959, **14**: 59-70.

Amongst the 29 papers delivered in November, 1958, at the congress organized by the National Federation of Associations for Crop Protection, which are summarized here, the following are of direct horticultural interest: Physiological action of fungicidal products in regard to fruit preservation, by R. Ulrich; Problems caused by fungal diseases of market garden crops, by J. Louvet; Fungicidal technique applied to industrial beetroot production, by L. A. Durgeat; The treatment of mildew and canker of apple trees, by J. Bulit; Anticryptogamic treatments for the peach tree, by C. Grosclaude; Fungicides and treatment of the vine, by P. Marsais; Research into an active material for the control of anthracnose of arabica coffee leaves, by C. Goormans; *Cercospora* disease of oil palms, by A. Bachy; The control of banana leaf spot disease, by J. Cuillé; Trials on the control of tobacco powdery mildew in Madagascar, by the Plant Protection Service of CTAT and ORSTOM and the Agronomy Station of Lake Alaotra; Problems caused by fungicidal treatments undertaken against pod rot of cacao, by R. Renaud; and Trials and demonstrations on the control of cacao pod rot in the Ivory Coast, by R. Coste.

3476. VAN LAERE, O., AND GILLARD, A.
Het gebruik van scheikundige afweerstoffen ("repellents") tegen bijen. **(The use of chemical repellents against bees.)** [French summary 1 p.]
Parasitica, 1959, **15**: 53-70, bibl. 18.

Bee repellents would be valuable to prevent bees from visiting crops sprayed with toxic materials. In laboratory tests, camphor and phenol were the most powerful repellents, and both were effective in small quantities. They were less persistent than dimethyl phthalate, ethylhexane-1,3-diol and isoamyl amygdalate, but also less phytotoxic.

3477. Furmidge, C. G. L.
Physico-chemical studies on agricultural sprays. I: General principles of incorporating surface-active agents as spray supplements. II: The phytotoxicity of surface-active agents on leaves of apple and plum trees.
J. Sci. Food Agric., 1959, **10**: 267-73, bibl. 31, and 274-82, bibl. 15, illus.

The phytotoxicity of solutions of anionic, cationic and non-ionic surface-active agents to the leaves of several varieties of apple and plum trees is described. The leaf damage is shown to be dependent largely on the chemical nature and the concentration of the surface-active agent and also on the species of tree. Other factors which affect the damage to a more limited extent are the variety and manurial status of the tree, the age of leaf and weather conditions. Many of the ionic materials cause considerable leaf damage, particularly cationic materials on plum leaves, but the non-ionic materials are relatively safe to use. The damage is considered to result from the disorganization of the cell permeability barriers following the penetration of the surface-active agent through the leaf cuticle. Possible routes for such penetration are discussed. [Author's abstract of 2nd paper.]—Long Ashton Res. Stat., Bristol.

3478. Goossen, H.
Studies on the efficiency of spraying and atomising in fruit farming in relation to distribution of wash, deposition of active ingredient and rain-resistance of deposits applied by spraying and atomising.
Höfchen-Briefe (English edition), 1958, **11**: 132-54, bibl. 20, illus.

Orchard comparisons of 4 spraying machines showed that, when equal quantities of spray were applied per acre, more active ingredient was deposited by spraying than by atomizing. Reduction of the atomizing rate from 325 l./ha. (1 : 4) to 185 l./ha. (1 : 7) resulted in a much lower deposit of the active ingredient. For spraying a curved boom was more effective than a spray gun, which produced relatively large droplets of solution. Deposits from atomizers were more resistant to rain than those from sprayers. Deposits from all machines were relatively low on leaves more than 200 cm. above ground level, and it is suggested that more even distribution by atomizer may be obtained by blowing more air through the upper part of the atomizing sector. Droplets should exceed 150 microns when atomizing to reduce loss caused by spray drift. Differences in pest control with fully mechanical spraying (at 1,300 l./ha.) and with atomizing (325 l./ha.) were small.—Crop. Prot. Div., Dep. Agric., Westphalia.

3479. Gunkel, W. W.
Deposit of mist-concentrate spray as influenced by droplet size, air velocity, temperature and humidity.
Diss. Abstr., 1959, **19**: 3257, being *L.C. Card No. Mic.* 59-1327 of 106 pp.

An analysis of the data indicated that the effects of temperature, droplet size and air velocity and of most interactions between them were highly significant, while the effect of humidity was significant at the 5% level. 150-micron droplets were most effective at relatively low temperatures.

3480. Darrow, W. H., Jr.
How we use the airplane.
Proc. N.Y. St. hort. Soc., 1959, 1959, **104**: 180-2.

Among advantages claimed for air dusting of orchards are: 1. Reduction of labour used in the primary scab season. 2. No damage to orchard surface by heavy machinery. 3. Saving in material by waiting till certain of an infection period. 4. Speed of operation. 5. Better scab control. 6. Better quality fruit owing to low residues and reduced russeting. 7. Saving on investment in machinery. 8. Low water requirements. The disadvantages are: 1. Necessity for a really first class and conscientious pilot, who must fly late and early at tree-top level in good and bad weather and must be certain to see that all is sprayed. 2. Plane must be locally based. 3. There must be a reserve pilot in case of need. 4. Insect control by air dusting is not completely mastered yet. 5. Expense of air dust materials. There was little difference between results obtained with a helicopter and a small Stearman biplane. The cost of applying 3% Phygon (including material) is estimated at \$4.25–\$4.75 an acre. Poisoned corn for mouse control has been similarly successfully applied.

3481. Bulit, J., and Louvet, J.
Fongicides appliqués au pal ou à l'explosif en cultures maraîchère et fruitière. **(The application of fungicides by lance or by explosive in the market garden and in the orchard.)**
Reprinted from *Phytiatrie-Phytopharm.*, 1958, **7**: 15-19.

Under conditions of the experiments the injection of chloropicrin into the soil proved superior to watering with formaldehyde for the control of *Fusarium oxysporum* on melons and for the destruction of the sclerotia of *Sclerotinia sclerotiorum*. Soil fumigation with chloropicrin and ethylene dibromide, placed in vessels on top of explosive charges at a depth of 1 m., gave promising results against *Armillaria mellea* in orchards.—Stat. centr. Path. vég., Versailles.

3482. Anon.
Applicator designed for silica gel insecticide.
J. agric. Food Chem., 1959, **7**: 513.

A hand applicator for use with Dri-Die Insecticide 67, the treated silica gel powder [see abstract 3472] has been designed by W. R. Grace and Co., Davison Chemical Division. The device consists of a polythene container to which 2 attachments can be fitted. One is a long blowing nozzle for general distribution, and the other is a device which, by a rolling action, will spread the insecticide on to a strip of surface.

3483. WYLIE, W. D., AND WESTBROOK, C. J.
Peach tree borer control.
Ark. Fm Res., 1957, **6**(5): 3, illus., [received 1959].

A 7-foot rod, which is attached to a power sprayer and carries a curved boom with 3 nozzles, is especially adapted for providing a thorough spray coverage on tree trunks. [See also abstract 3462.]

Noted.

3484.

a BAUMANN, G.
Wirtspflanzen des Pflaumenbandmosaik-Virus in mittel- und norddeutschen Obstanlagen und Baumschulen. (**Host plants of the line-pattern virus of plums in the orchards and nurseries of central and northern Germany.**) [English summary ½ p.]
Phytopath. Z., 1959, **35**: 277-91, bibl. 20, illus.
Prunus spinosa and *P. triloba* are new hosts.

b BÖHM, H.
Die Ebereschenmotte, ein gelegentlicher Apfelschädling. (**The mountain ash moth, an occasional apple pest.**)
Pflanzenarzt, 1957, **10**: 105, from abstr. in *Z. PflKrankh.*, 1959, **66**: 315.
Injuries to apple fruit by *Argyresthia conjugella* described; control by parathion or DDT in early July.

c BOURDIER, L.
Rivoluzione nella tecnica della difesa sanitaria della vite. (**Revolution in the technique of maintaining healthy vines.**)
Progr. agric., 1959, **5**: 688-94, illus.
Low-volume spraying of vines for control of downy mildew.

d BOVEY, R.
Le dépérissement de l'abricotier en Valais, est-il causé par des virus? (**Is the degeneration of apricot trees in Valais caused by virus?**)
Rev. romande Agric. Vitic., 1959, **15**: 44-7, bibl. 6, illus.
Yes, it has been transmitted by grafting.

e BRAUNS, M.
Beiträge zur Züchtung moniliaresistenter Sauerkirschen. I. Mitteilung über Infektionsversuche mit *Sclerotinia laxa* Aderh. et Ruhl. und *Sclerotinia fructigena* Schroet. an Sauerkirschsorten. (**On the breeding of monilia resistant acid cherries. I. Inoculation experiments with *Sclerotinia laxa* and *S. fructigena* on acid cherry varieties.**)
Züchter, 1959, **29**: 143-9, bibl. 19, illus.
Inoculation of shoots preferable to that of stigmata; varietal responses to infection described.

f CHABOUSSOU, F.
Techniques de lutte contre les insectes des fruits. (**Control of fruit pests.**)
Congr. pomol., 89me Session, Toulouse, 1958, 1959, pp. 95-118, bibl. 62.
A review dealing with biological factors, chemical control, economics and cultural measures.

g COOMBE, J.
63 years of fruit tree spraying in Canterbury.
N.Z. J. Agric., 1959, **98**: 427-32, illus.
Developments in equipment.

h DARPOUX, H.
Vues nouvelles en matière de lutte contre quelques maladies cryptogamiques des arbres fruitiers à pépins. (**New ideas on the control of some pome fruit diseases.**)
Congr. pomol., 89me Session, Toulouse, 1958, 1959, pp. 72-86, bibl. 9, illus.
Pear and apple scab, apple mildew and canker, their prevention, treatment and eradication prospects.

i DARPOUX, H., AND ARNOUX, M.
Action du pétrole et de l'arseniate de plomb sur la tavelure et la septoriose du poirier. (**The action of petroleum oil and lead arsenate on scab and leaf fleck of pears.**)
Reprinted from *Phytiatrie-Phytopharm.*, 1958, **7**: 47-50.
Both compounds showed some fungicidal activity.

j DEXTER, P. M.
"Trithion" effective against red spider in peaches.
Fruit World, Melbourne, 1959, **60**(2): 35.
Trithion applied in mid-December gave excellent control for at least 8 weeks.

k DIENER, T. O., AND WEAVER, M. L.
A caffeine additive to aid mechanical transmission of necrotic ringspot virus from fruit trees to cucumber.
Phytopathology, 1959, **49**: 321-2, bibl. 3.
A technique increasing the usefulness of cucumber as an indicator plant for the disease on cherries.

l ELLERTSON, F. E., AND RITCHER, P. O.
Biology of rain beetles, *Pleocoma* spp., associated with fruit trees in Wasco and Hood River counties.
Tech. Bull. Ore. agric. Exp. Stat. **44**, 1959, pp. 42, bibl. 75, illus.
Damage caused and natural enemies.

m ENGEL, H.
Advantages and disadvantages of oleophosphoric ester products.
Höfchen-Briefe (English edition), 1958, **11**: 124-8, bibl. 9.
Bud-burst applications of oleophosphates to replace winter sprays on fruit are discussed.

n FAO.
A list of national plant quarantine services.
[*Publ.*] *Plant Prodn Prot. Div. FAO*, Rome, 1959, pp. 13.

o GAUDSCHAU, M. D.
Ein neuer Weg zur Starenvertreibung aus den Weinbergen. (**A new method of driving starlings from vineyards.**)
Württemb. Wbl. Landw., 1958, **125**: 1748, from abstr. in *Z. PflKrankh.*, 1959, **66**: 316-17.
By disturbing their sleeping quarters on 3 successive nights.

p GODAN, D.
Untersuchungen über den Einfluss organischer Phosphorpräparate auf das Verhalten von Insekten. (**Studies on the effect of organic phosphorus preparations on the behaviour of insects.**) [English summary 22 lines.]
Z. PflKrankh., 1959, **66**: 338-53, bibl. 12.
The attractant, repellent and toxic effects of parathion, Diazinon and demeton on various pests.

q GUALACCINI, F.
Una virosi nuovo del castagno. (**A new virus of chestnut.**) [English summary 8 lines.]
Boll. Staz. Pat. veg. Roma, 1958 (issued 1959), **16**: 67-75, bibl. 4, illus.
Symptoms are line pattern and oak leaf spots and flecking on leaves,

r HAGLEY, E. A. C.
Pyrethrum—a note on its horticultural application.
Pyreth. Post, 1959, **5**(1): 23-4, bibl. 22.
A review of recent literature.

s HERING, M.
Beobachtungen über den Massenwechsel der Spinnmilben in den Weinbergen der Mittelmosel. (**Observations on the fluctuation of spider mite populations in the vineyards of the central Moselle area.**)
Reprinted from *Weinberg u. Keller*, 1958, **5**: 631-44, bibl. 18.
Including the effects of some insecticides and fungicides.

t HITCHCOCK, R.
Stone fruits. Prunes saved by a light.
Amer. Fruit Gr, 1959, **79**(3): 40, illus.
Lights attached to orchard thermometers warn of freezing temperatures.

u LILJEDAHL, L. A., AND STRAIT, J.
Spray deposits measured rapidly.
Agric. Engng St. Joseph, Mich., 1959, **40**: 332-5, bibl. 19, illus.
A method of measuring fluorescence and results of a field test described.

v LOTT, T. B.
The identity of small bitter cherry and western X little cherry.
Canad. J. Plant Sci., 1959, **39**: 183-6, bibl. 10.
Both diseases caused by the same virus.

w MARTIN, G. C.
Control of root-knot nematodes (*Meloidogyne* spp.) in gardens and nurseries.
Rhod. agric. J., 1959, **56**: 65-8, bibl. 2, illus.
Recommendations for reducing populations by fumigation, hygiene, etc.

x MATHYS, G.
Vers un tournant dans la lutte contre le pou de San-José? (**Towards a revolution in the control of San José scale?**)
Rev. romande Agric. Vitic., 1959, **15**: 53-6, bibl. 3, illus.
The multiplication and establishment of the parasite *Prospaltella perniciosi*.

y MEHL, S.
Naturgeschichte und Abwehrmöglichkeiten von Mäuseplagen in den Obstanlagen des Etschtales zwischen Meran, Bozen und Salurn (Südtirol, Italien). (**Natural history and prevention of mouse infestations in the orchards of the Adige valley between Merano, Bolzano and Salorno (Southern Tyrol, Italy).**)
Gartenbauwiss., 1958, **23**: 433-46, bibl. 22, illus.
Control of *Arvicola terrestris* with endrin discussed.

z MINISTRY OF AGRICULTURE, LONDON.
Cutworms.
Adv. Leafl. Minist. Agric. London **225**, revised 1959, pp. 4, illus.
Supersedes the 1957 leaflet [see *H.A.*, 28: 1317d]. Control measures now include aldrin.

3485.

a MÜLLER, E. W.
Untersuchungen zur Kontrolle des Massenwechsels von Obstbaumspinnmilben. (**Studies on recording the population dynamics of fruit tree spider mites.**)
NachrBl. dtsch. PflSchDienst, Berlin, 1959, **13**: 74-8, bibl. 22, illus.
Imprint recording, which is described, is recommended for estimating spider mite populations.

b NAEF, J.
Kräuselmilben-Bekämpfungsversuche. (**Experiments on the control of *Phyllocoptes vitis*.**)
Schweiz. Z. Obst- u. Weinb., 1959, **68**: 314-15.
Lime-sulphur superior to wettable sulphur or malathion for controlling the mite on vines.

c NORDBY, A.
Fordelingen av plantevermiddel ved tåkesprøyting av eldre epletre. (**The distribution of plant-protective chemicals on mature apple trees following mist application.**) [English summary 1 p.]
Meld. Norg. LandbrHøgsk., 1959, **38**: 1-21, bibl. 18, illus.
Using Nigrosine as spray material and polythene strips fastened to the leaves.

d N.S.W. DEPARTMENT OF AGRICULTURE, BIOLOGICAL BRANCH.
Powdery mildew of apples.
Agric. Gaz. N.S.W., 1958, **69**: 530-3, illus.
Including a spray schedule with lime sulphur or Karathane.

e POSNETTE, A. F., AND CROPLEY, R.
Transmission of a virus causing star crack of apples.
J. hort. Sci., 1959, **34**: 126-9, bibl. 5, illus.
In addition to fruit cracking, some isolates also caused delayed leafing out, die-back and bud cankers.

f POWELL, D. M., AND WYLIE, W. D.
The grape berry moth in northwest Arkansas.
Ark. Fm Res., 1959, **8**(1): 11, illus.
Complete control obtained with 3 sprays of lead arsenate, DDT, Sevin, Guthion or Trithion.

g PRATELLA, G. C.
Phytophthora cactorum (Leb. et Cohn) Schröt., agente del marciume pedale del melo. (**The fungus which causes collar rot of apples.**)
Ann. Sper. agrar., 1959, **13**(2), Suppl. pp. XLIX-LX, bibl. 16, illus.
Including symptoms of the disease and its spread in Italy.

h ROSENTHAL, I., GORDON, C. F., AND STANLEY, E. L.
Microdetermination of TDE in spray residues.
J. agric. Food Chem., 1959, **7**: 486-8, bibl. 9, illus.
Determination of residues of 1,1-dichloro-2,2-bis (*p*-chlorophenyl)-ethane in fruit and vegetables.

i SCHÄLLER, G.
Untersuchungen über die Gallbildung und Nekrosereaktion der Rebensorten unter Berücksichtigung der Rassendifferenzierung der Reblaus. (**Studies on the gall formation and necrosis reaction of vine varieties, with special reference to race differentiation in phylloxera.**) [English summary 16 lines.]
Phytopath. Z., 1959, **36**: 67-83, bibl. 30, illus.

j SHARPLES, R. O., AND SOMERS, E.
Control of *Gloeosporium perennans* with formulations of eradicant fungicides.
Plant Path., 1959, **8**: 8-12, bibl. 10.
Phenyl mercuric chloride in spray and paint formulations with additives [see also *H.A.*, 29: 252].

k SIMONDS, A. O.
Peaches. Remedy for chlorosis.
Amer. Fruit Gr, 1958, **78**(10): 22-3, illus.
Versenol or Sequestrene iron chelates applied to soil at 2 lb. per tree.

l SKERRETT, E. J., AND BAKER, E. A.
A new colour reaction for dieldrin and endrin.
Chem. Ind. Lond., 1959, No. 17, p. 539, bibl. 13.
A sensitive method of detecting residues developed at Long Ashton.

m STAPLEY, J. H., AND SCOTT, P. D.
The fruit tree red spider is becoming resistant to summer ovicides.
Comm. Gr, 1959, No. 3310, pp. 1373-5.
Mites resistant to chlorfenson and chlorbenside were controlled by Metasystox.

n SUMMERS, F. M., AND PRICE, D. W.
Emergence and development of the overwintered generation of peach twig borer larvae.
J. econ. Ent., 1959, **52**: 340-1, bibl. 2.
Anarsia lineatella in California; in relation to time of spraying.

o WELSH, M. F., AND OTHERS.
Tree fruit virus diseases in British Columbia.
Commonw. phytopath. News, 1959, **5**: 25-6.
A brief account of recent investigations.

p WINTER, F.
Das Spätfrostproblem im Rahmen der Neuordnung des südwestdeutschen Obstbaues. (**The problem of late frost and the reorganization of fruit growing in south-western Germany.**)
Gartenbauwiss., 1958, **23**: 342-62, bibl. 26.
Includes methods of temperature measurement during radiation nights.

WEEDS AND WEED CONTROL.

General.

(*See also* 3183, 3542h, 3543, 4159.)

3486. Palmiter, D. H.
Evidence of quack-grass toxicity to apple seedlings.
Abstr. in *Phytopathology*, 1959, **49**: 228-9.

Potted apple seedlings watered with a cold-water extract of quack-grass (*Agropyron repens* L.) rhizomes failed to grow normally. One half of the treated trees died within 60 days of the time the treatment started. Plants that survived were rosetted and averaged about $\frac{1}{10}$ the size of control plants. Some of the leaves on treated plants became chlorotic, and later showed necrosis. An equal number of control seedlings received no extract and grew normally. Other apple seedlings were grown in a liquid medium containing quack grass extract. These plants developed symptoms similar to those of treated trees in pots. The roots did not appear to be injured by the extract, but the leaves became chlorotic and the top growth was stunted. Roots of control seedlings (no extract) were soon attacked by various fungi. These fungi did not develop where the extract was used, indicating its toxicity to fungi as well as to apple seedlings. The nature of the toxic substance leached from quack-grass rhizomes has not been determined.

3487. Welbank, P. J.
Production of toxic substances by *Agropyron repens.*
A.R. Rothamsted exp. Stat. 1958, 1959, pp. 87-8.

Kale, tomato and cereal plants growing in nutrient solutions were transferred on alternate days to a leachate of *Agropyron* roots and rhizomes, or to distilled water as controls. After 4 weeks dry weight and leaf area were higher in treated kale and tomato plants than in control plants. When nutrient solution was added to both leachate and distilled water, kale responded as above, but tomato was not affected. Kale growing in pots of fertile and infertile soil was watered daily with the leachate, the only result being a slight reduction in dry weight of the plants in the infertile soil. The growth rate of turnip seedling radicles was increased 30% by a diffusate from the roots of intact plants of *A. repens* into filter paper, moistened with distilled water, which served as a substrate, but the increase was less marked when nutrient solution replaced the distilled water. Hypocotyl growth was slightly retarded by the root diffusate. There was no evidence of the competitive action of the grass being due to the exudation of toxins.

3488. Walters, C. S., and Peterson, K. R.
Burning tree stumps with Stumpfyre.
Circ. Ill. agric. Ext. Serv. **795**, 1958, pp 6, illus.

Stumps were impregnated through vertical bore holes with a mixture of 3 parts by weight of cupric chloride, 9 of sodium dichromate, 2 of basic lead acetate and 2 of manganese chloride, thinned with 2 pints of water. When fired, such stumps were burned to the extent of 80% compared with 30% for untreated stumps.

Herbicides.

(*See also* 3154, 3155, 3177, 3504, 3542c, d, k, n, 4054.)

3489. Bowers, W.
Band spraying pre-emergence herbicides.
Circ. Ill. agric. Ext. Serv. **791**, 1958, pp. 6, illus.

Band-spraying a strip 12 to 14 in. wide over the row during sowing can give complete, cheap weed control, provided the weeds between the rows are removed by later cultivation. The equipment used for the purpose is described.

3490. Currier, H. B., and Dybing, C. D.
Foliar penetration of herbicides—review and present status.
Weeds, N. York, 1959, **7**: 195-213, bibl. 182.

A review covering the pathways of initial penetration of herbicides; movement in the leaf; and factors influencing penetration and movement (these being plant factors, environmental factors, composition of the spray solution, and methods of application). In conclusion, the authors summarize several problems which need investigating in connection with chemicals applied to leaves.—Univ. Calif., Davis.—*Weed Abstr.*, **8**, 1367.

3491. Leonard, O. A.
Studies on the absorption and translocation of 2,4-D in bean plants.
Hilgardia, 1958, **28**: 115-60, bibl. 31, illus.

The effects of varying the form, concentration and dosage of 2,4-D on its herbicidal activity, and also the addition of diluents, humectants and surfactants, were investigated by the drop and spray methods. In the drop method large differences were observed in the effectiveness of the diluents, and the most effective surfactant was Vatsol OT, except at low dosages with the tri-ethylamine salt, for which Tween 20 was better. At high dosages the esters were more effective than the amines, of which the best was the 2-ethylhexylamine. Placement proved important, the base of the leaf being the most effective site. Very little spread of 2,4-D within the leaf occurred, but a certain amount escaped from the sieve tubes during translocation. With radioactive 3-amino-1,2,4-triazole and maleic hydrazide much more extrafascicular diffusion took place. Using the spray method, Tween 20 was outstandingly successful as a surfactant at low concentrations (125–250 p.p.m.), and the type of formulation had only an insignificant effect when this additive was used. Higher concentrations were lethal.

3492. Datta, S. C., and Dunn, S.
Effects of light quality on herbicide toxicity to plants.
Weeds, N. York, 1959, **7**: 55-65, bibl. 8.

The sodium, ammonium and amine salts and methyl, ethyl and isopropyl esters of 2,4-D were all found to produce the greatest decrease in the dry weights of mustard and tomato under conditions of blue, pink or red light, i.e. in those regions of the spectrum most active in photosynthesis.—N.H. agric. Exp. Stat., Durham.—*Weed Abstr.*, **8**, No. 1161.

3493. Shimokawa, M., Ozawa, H., and Sugiyama, C.
Soil fumigation with methyl bromide, No. 3 (Parts 4 and 5). [Japanese, with English summary $\frac{1}{8}$ p.]
Bull. Kanagawa agric. Exp. Exp. Stat., hort. Branch, 1959, No. 7, pp. 32-6, illus.

Methyl bromide applied at the rate of 2·5 c.c. per 30 sq. cm. killed all annual and some perennial weeds in seed beds. As a fumigant, it was effective to a depth of 180 cm. and, at a rate of 4 c.c. per 30 cu.m. was as effective as chloropicrin at the same dosage. [For No. 1 in this series, see *H.A.*, 27: 1066.]

3494. Barnsley, G. E., and Yates, J.
An assessment of sodium diphenylborinate as a selective herbicide.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 10, bibl. 8.

Reactions of weed species, vegetable crops and ornamental trees are reported. In the seedling stage radishes, lettuces, french beans, broad beans, tomatoes and carrots were injured by 1–2 lb. of the compound per acre. Grasses, onions, peas and various conifers were tolerant to considerably higher rates.—Woodstock agric. Res. Cent., Kent.—From *Weed Abstr.*, **8**, No. 938.

3495. Hirst, R. H., and Martin, D. L.
Weed control in various fodder and vegetable crops with sodium monochloroacetate.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 7, bibl. 1.

Sodium monochloroacetate gave promising results in spring cabbage at the 3–5-leaf stage or 7–10 days after planting out, except where frost followed treatment at 20 lb./ac.; in savoys and brussels sprouts at the 3–5-leaf stage at 20 lb./ac.; in swedes after the 4-leaf stage at 20 lb./ac.; in onions and leeks from the post-crook to the 3–4-leaf stages at 30 lb./ac. [See also *H.A.*, 28: 2495.] The following crops were damaged: cauliflowers, turnips, beet, carrots, lettuce and peas.—From *Weed Abstr.*, **8**, No. 970.

3496. Richards, R. F.
Recent results of simazine and related triazines for selective weed control.
Proc. 12th south. Weed Conf., 1959, pp. 207-12, bibl. 3.

It is thought that resistant plants either break simazine down more quickly than they absorb it or do not decompose it at all. Ornamentals tolerant to simazine included mimosa, dogwood, hemlock, Austrian pine, *Viburnum*, *Podocarpus*, *Ligustrum*, *Pithosporium* [*Pittosporum*?], and pin oak. Citrus crops appear to be exceptionally tolerant of simazine. Other tolerant crops include asparagus, brambles, grapes, pineapples, strawberries, sugar cane and tomatoes. Simazine controlled several aquatic weeds, fish being unaffected by a rate of 10 lb./ac. Crops tolerant to the related compounds included some vegetables, tobacco and strawberries. [See also *H.A.*, 29: 329.]—Geigy Chem. Co., N.Y.—From *Weed Abstr.*, **8**, No. 1374.

3497. Gysin, H., and Knusli, E.
Activity and mode of action of triazine herbicides.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 10, bibl. 14.

Atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine), being more soluble than simazine, is much more effective against trees and brush. *Panicum* spp. are less, and *Convolvulus arvensis* is more, sensitive to atrazine than to simazine. Propazine (2-chloro-4,6-isopropylamino-s-triazine) may be used post-emergence in fennel, celery, parsley and carrots and possibly in artichokes, and trietazine (2-chloro-4-diethylamino-6-ethylamino-s-triazine) is promising for selective weed control in peas and tomatoes and possibly as a pre-planting treatment in tobacco.—Geigy Chem., Basle.—From *Weed Abstr.*, **8**, No. 1172.

Control of particular weeds.

(*See also* 3527, 3542a, b.)

3498. Antognini, J., and others.
Control of Johnsongrass and nutgrass with EPTC (Eptam).
From abstr. in *Proc. 12th south. Weed Conf., 1959*, p. 192.

EPTC at 4 lb./ac. incorporated in the soil before or immediately after sowing has given excellent seasonal control of seedling and established Johnsongrass [*Sorghum halepense*] and yellow and purple nutgrass [*Cyperus esculentus* and *C. rotundus*]. Crops successfully seeded immediately after treatment included carrots and snap and dry beans.—Stauffer Chem. Co., N.Y.—*Weed Abstr.*, **8**, No. 1313.

3499. HAUSER, E. W.
Some responses of nutgrass (*Cyperus rotundus* L.) to the potassium salt of gibberellic acid.
From abstr. in *Proc. 12th south. Weed Conf., 1959*, p. 193.

The application of potassium gibberellin stimulated foliar growth and resulted in decreased growth of below ground parts.—U.S. Dep. Agric., Experiment, Ga.—*Weed Abstr.*, **8**, No. 1317.

3500. HAUSER, E. W.
A preliminary study of the interaction of herbicides and potassium gibberellin on nutgrass (*Cyperus rotundus* L.).
From abstr. in *Proc. 12th south. Weed Conf., 1959*, pp. 196-7.

Evidence was obtained that gibberellin may increase the effect of dalapon, 2,4-D and EPTC on *C. rotundus*.—U.S. Dep. Agric., Experiment, Ga.—*Weed Abstr.*, **8**, No. 1373.

3501. KRAMER, M.
O contrôle da tiririca com produtos químicos. **(Control of nutgrass with chemical products.)** [English summary ¾ p.]
Biológico, 1959, **25**: 39-44, bibl. 12, illus.

The most effective of the herbicides tested, although greatly reducing the infestations of nutgrass (*Cyperus rotundus*), did not give complete eradication. Repetition of treatment was essential in all cases. The best results were obtained with 2,4-D derivatives, especially (1) Bi-Hedonal (2,4-D + MCPA) at 2 c.c. per sq. m., (2) a mixture of 2,4-D amine at 1 c.c. per sq. m. with TCA-90 at 4 g. per sq. m., and (3) the same amine as in (2) with Herbicide 'C' at 10 g. per sq. m.

3502. IZARD, C., AND HITIER, H.
Action du 1,3-dichloropropane 1,2-dichloropropene, de la Rindite et de la gibbérelline, sur la germination des graines de l'orobanche, parasite du tabac. **(Effect of D-D, Rindite and gibberellin on the germination of broomrape parasitizing tobacco.)**
C.R. Acad. Sci., Paris, 1958, **246**: 2659-61, from *CORESTA Inf. Bull.*, 1958, No. 3, Abstr. 1744.

Both D-D and Rindite (a 7: 3: 1 mixture of glycol monochlorhydrin, ethylene dichloride and carbon tetrachloride) inhibited germination of broomrape seed; Rindite was the more effective but is highly volatile. Gibberellin broke the dormancy of the seeds, both in light and in darkness, and could be used to induce germination of broomrape before planting the tobacco. [For earlier work see *H.A.*, 28: 387.]

3503. CHANCELLOR, R. J., COOMBS, A. V., AND FOSTER, H. S.
Experiments on the control of aquatic weeds by means of copper sulphate.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 6, bibl. 1.

Species susceptible and resistant to 0·25–1 p.p.m. of copper sulphate are listed. [For earlier work see *H.A.*, 27: 3347.]—Dep. Agric., Oxford.—From *Weed Abstr.*, **8**, No. 1047.

3504. VAN OVERBEEK, J.
A new herbicide for aquatic weed control.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 2, bibl. 3.

A method has been developed in which F 98 aquatic herbicide (essential ingredient acrolein) will control submersed weeds (*Potamogeton crispus*, *Elodea densa*) in irrigation canals and ponds. In experiments in California, weeds were controlled in canals with 300 cu. ft./sec. flow, as far as 15–20 miles below the point of application of 1–1·5 gal. F 98 per cu. ft./sec. of water flow (introduced in 30–45 minutes). This method was far more effective than chaining, and lasted for up to 8 weeks after treatment, the dead vegetation disintegrating.—Shell Develop Co., Calif.—From *Weed Abstr.*, **8**: No. 1046.

3505. NORMAN, I. W.
CMU makes channel clearing easy.
Dairyfmg Dig., 1958, **5**(4): 33-5, illus.

Monuron at 30 lb./ac. is recommended for clearing irrigation channels, if applied at least 6 weeks before the next irrigation season starts. Only one application each season is necessary. This will reduce *Paspalum distichum* to a minor problem, and a second dose will kill it.—Dep. Agric., Victoria.—From *Weed Abstr.*, **8**, No. 1070.

3506. LEVI, E.
The control of water couch (*Paspalum distichum* L.) in irrigation channels by 3-amino 1,2,4-triazole (Amizole).
J. Aust. Inst. agric. Sci., 1959, **25**: 62.

Amizole, applied with a knapsack sprayer at a rate equivalent to 50 lb./acre, completely eradicated water couch from irrigation channels. This rate was also effective against *Typha angustifolia*.—C.S.I.R.O., Irrig. Res. Stat., Griffith.

Weed control in temperate fruit and nut crops.

(*See also* 3207, 3377a, 3518, 3529, 3542k, o.)

3507. ROBINSON, D. W.
The use of herbicides in apples, raspberries and strawberries.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 5, bibl. 7.

Apples: Dalapon at single rates up to 10 lb./ac. and at 7·5 lb./ac. applied twice (March and July) caused no injury to apple trees of 8 varieties that were over 5 years old. When applied at 3·75 and 7·5 lb./ac. in October to maiden trees, leaf stunting and chlorosis occurred in the spring, and the varieties Merton Worcester and Laxton's Fortune received a severe growth check, and Howgate

Wonder and Arthur Turner a moderate check; Lord Lambourne appeared fairly tolerant. All varieties recovered by September. Rates of 15 lb./ac. and over caused a growth check for 1 year to mature trees. MCPA at 1–2 lb./ac. alone or at 1·5 lb./ac. combined with dalapon at 3·75 and 7·5 lb./ac. applied carefully during the growing season caused no injury to mature trees. Achievements in weed destruction are noted. *Raspberries:* Monuron at 2 lb./ac. gave good control of *Poa annua* without injury or crop reduction in the same year, but there were indications of reduced yield the following season. Dalapon applied during dormancy at 3·75 and 7·5 lb./ac. caused injury in one trial, but in another at 3·75 lb./ac. it was harmless to vigorous canes. MCPA at 1 and 2 lb./ac. applied in the winter and simazine at 2–8 lb./ac. and 2,4-DES at 4 lb./ac. applied in the growing season were all harmless to raspberries. Fenuron at 0·25 and 0·5 lb./ac. ± 2,4-DES at 4 lb./ac. in the growing season caused leaf injury but did not affect yield or later growth. *Strawberries:* Dinoseb (amine and ammonium) gave good control of *Stellaria media* in 2 trials without reducing the yield of Climax strawberries. Dalapon was injurious to Talisman at rates of 2 lb./ac. and over. Propham at 4 lb./ac. and CIPC at 3 lb./ac. applied in February gave good control of *P. annua* and *S. media* in one trial without reducing the yield of Climax, but in another trial control of *P. annua* was not complete and the CIPC reduced the yield of Cambridge Vigour but not that of Talisman. A mixture of CIPC at 2 lb./ac. and fenuron at 0·5 lb./ac. has given better weed control than CIPC alone at 4 lb./ac., and, when applied in November and January, it caused no injury to Red Gauntlet or Talisman, but severely injured Vigour, which starts growing earlier. Trials with 2,4-DES pre-emergence have confirmed its usefulness and have never caused a crop reduction, but *P. annua* and *S. media* are moderately resistant. The addition of fenuron at 0·25 lb./ac. to 2,4-DES at 4 lb./ac. gave much better weed control without affecting yield, except at one location where a 15% reduction was caused. [See also *H.A.*, 29: 2378.]—From *Weed Abstr.*, **8**, No. 983.

3508. Curtis, O. F., Jr.
Experiments and experiences in the control of grass and weeds.
Proc. N.Y. St. hort. Soc. 1959, pp. 129-33.

The author bases the following advice on his experience with Dowpon for grass control under apples: Treat grass in spring when new grass leaves are not more than 6 or 8 in. high. Spray at 10 lb./100 gal. per acre if quack grass [*Agropyron repens*] is dense. Coverage should ensure that some spray reaches most leaves on every grass shoot. This will not give 100% control and treatment will be needed the following spring.

3509. Pisareva, M. G.
Herbicides in horticulture. [Russian.]
Sad i Ogorod, 1959, No. 3, pp. 50-1.

Good control of broad-leaved weeds was obtained under apples with DNC or PCP at 10 kg./ha. and of grasses with propham at 16 kg./ha. or CIPC at 12 kg./ha. Propham at 16 kg./ha. was effective in raspberries and gooseberries, but CIPC and DCU injured raspberries.

3510. Gilbert, F. A., Holm, L., and Haltvick, E.
The control of weeds in newly established sour cherries.
Weeds, N. York, 1959, **7**: 223-9, bibl. 8, illus.

Experiments are reported in which monuron at 2·5 lb./ac. ± CIPC at 20 lb./ac. were used successfully for the control of broad-leaved weeds and grasses in sour cherry orchards for 4 years. Detailed examination revealed that the herbicides had no detrimental effect on the growth and development of the trees during this period. In observation plots where monuron at 5 or 10 lb./ac. has been applied annually for 6 years there is evidence of crop injury.—Univ. Madison, Wis.—*Weed Abstr.*, **8**, No. 1250.

3511. Robinson, D. W.
The use of herbicides in bush fruit crops.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 6, bibl. 3.

Black-currants: Dalapon at 15 lb./ac. + MCPA at 2 lb./ac. in 50 gal. applied in August gave complete control of *Agropyron repens* and *Ranunculus repens*, without showing toxic effects on any of the varieties tested or any yield reduction the following year. Other treatments applied in the spring also gave good weed control and caused little or no crop injury. *Gooseberries:* Dalapon applied in March caused no injury at 1·9 lb./ac., very slight leaf chlorosis and marginal necrosis at 3·75 and 7·5 lb./ac. and more severe necrosis at 15 and 30 lb./ac., but damage was only temporary even at the highest rates. No serious injury or yield reduction was noted from other treatments applied at different dates; the best weed control was obtained with CIPC at 2 lb. + fenuron at 0·5 lb./ac. applied after hoeing. [See also *H.A.*, 29: 2378.]—Hort. Cent., Loughgall, N. Ireland.—From *Weed Abstr.*, **8**, No. 985.

3512. Kays, W. R., and Mead, P. K.
Chemical weed control experiment with strawberries and blackberries.
Bull. Okla St. Univ. Exp. Stat. **B-530**, 1959, pp. 15, bibl. 6, illus.

Strawberries: Spray applications of herbicides were directed over rows of Blakemore strawberries, the interrows being cultivated as needed to control weeds. On newly cleared land, not mulched, 1½ lb./ac. of 2,4-D was the best treatment; on "old" previously cultivated land, not mulched, 1 gal./ac. of CIPC, and on "old" land, mulched with rye straw, 8 lb./ac. of 2,4-DES were the most satisfactory herbicides. Mulching strawberries on "old" land more than trebled yields as compared with non-mulched "old" or newly cleared land. *Blackberries:* Of 4 herbicides applied to the base of Lawton blackberry plants in the row, the best was 2,4-D at 1½ lb./ac.

3513. HOLLOWAY, R. I. C.
Tests of 2,4-DES, CIPC and dinoseb on Royal Sovereign strawberries.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 5, bibl. 8.

Results are given of a 3-season field trial, in which 2,4-DES at 3 or 5 lb. /ac. was applied 3 times during the summer, approximately before flowering, before strawing and after fruiting, in conjunction with either CIPC at 2 lb./ac. or dinoseb (amine) at 2 lb./ac. in the winter, together with an unweeded control. All sprays were applied in 200 gal./ac. No significant difference was recorded between the 2 rates of 2,4-DES, and this alone had no harmful effects on the strawberry plants. In the second season when dinoseb and CIPC were applied at the end of November and the crowns of the plants were avoided, yields and vigour did not differ significantly from the controls, whereas in the third season when overall applications were made in mid-January, CIPC reduced yields significantly and both compounds reduced vigour significantly. Throughout the trial 2,4-DES reduced the weed cover by 10–30%. Four months after the first winter treatment the dinoseb plots were weed free, whereas on the CIPC plots there were a few plants of *Senecio vulgaris*.—East Malling Res. Stat.—*Weed Abstr.*, **8**, No. 987.

3514. VAILE, J. E.
Controlling weeds in vineyards.
Ark. Fm Res., 1957, **6**(4): 6, illus.

Monuron and diuron proved superior to other chemicals for the control of weeds in vines. An application of 3 lb./acre prevented the emergence or development of annual weeds for 15–22 weeks. A list is given of the annual weeds controlled by the two herbicides.

3515. BOURDIER, L.
Les désherbants en viticulture. **(Herbicides for viticulture.)**
Progr. agric. vitic., 1959, **151**: 286-91, bibl. 7, illus.

Applications of simazine (at 3, 5 or 8 kg./ha.) were not toxic to vines, but weed control was less satisfactory than with monuron or diuron at similar rates. At 5 and 8 kg./ha. both diuron and monuron caused various toxicity symptoms in treated vines, probably because they were more soluble than simazine and the season was unduly wet, with the result that they were washed down to the level of the vine roots. The rainfall amount in a year had a more important influence on phytotoxic effect than age of vine, rootstock or soil. Against bindweed (*Convolvulus* spp.) and *Aristolochia* sp. simazine was completely ineffective, but monuron and diuron gave reasonably good control.

3516. MCKAY, J. W., AND BERRY, F. H.
Herbicides for weed control in nut plantings.
49th A.R. north. Nut Grs' Ass. 1958, Beltsville, Md, pp. 75-8, illus.

Most broadleaved weeds and brush under nut trees (black walnut, Chinese chestnut and hickory) were eradicated by spraying with 1 gal. of a mixture containing 8·1% of 2,4,5-T plus 16·3% of 2,4-D in 100 gal. water. No injury to the nut trees has been observed so far. The same mixture was successfully used in September for weed control round Chinese chestnuts and black walnuts. Pre-emergence applications of DNBP gave good control of weeds in chestnut seedbeds, but in greenhouse tests DNBP reduced seed germination and seedling growth of chestnuts.—Agric. Res. Serv., Beltsville, Md.

Weed control in ornamentals and turf.

(*See also* 3542m.)

3517. ARMSTRONG, S. M.
Experiences with one pre-emergence herbicide.
Nat. hort. Mag., 1959, **38**: 118.

Granular 5% CIPC successfully controlled elm seedlings and annual weeds without injury to *Ilex crenata*, *I. cornuta*, *Viburnum carlcephalum*, Glenn Dale hybrid azaleas, *Mahonia bealei*, *M. aquifolium*, *Photinia serrulata*, *Camellia japonica*, *Juniperus* spp., *Vinca minor*, *Hedera helix* and *Liriope spicata.*

3518. CHAPPELL, W. E.
Further studies with granular herbicides in nursery crops.
Proc. 12th south. Weed Conf., 1959, pp. 102-6.

Granular (G) and/or spray (S) applications of several chemicals were made to a number of crops. Privet, treated on the day of transplanting into nursery rows, was affected only slightly, or not at all, by applications of granular NPA at 5 lb./ac., diuron at 1 lb./ac., dinoseb at 9 lb./ac., CIPC at 8 lb./ac., CDEC at 6 lb./ac. and EPTC at 7·5 lb./ac., but were injured by 2,3,6-TBA at 4 lb./ac., polychlorobenzoic acid at 4 lb./ac. and neburon (S) at 3 lb./ac. Young apple trees treated 4 days after planting out were unaffected by simazine (G and S) at 2 lb./ac., neburon (S) at 6 lb./ac., EPTC (G) at 7·5 lb./ac., CIPC (G) at 8 lb./ac., 2,4-DES (G) at 3 lb./ac. and dinitro (G) at 15 lb./ac., but injury was caused by NPA (G) at 3 lb./ac. Azaleas were only slightly affected by the following granular treatments (applied on the same day as planting out) simazine at 2 lb./ac., dinitro at 9 lb./ac., CIPC at 8 lb./ac., EPTC at 10 lb./ac. and neburon at 7·5 lb./ac. [For earlier work see *H.A.*, 28: 2471.]—Va agric Exp. Stat., Blacksburg.—From *Weed Abstr.*, **8**, No. 1245.

3519. FORET, J. A.
Control of bermudagrass in woody ornamentals.
Proc. 12th south. Weed Conf., 1959, pp. 100-1.

Dalapon was applied in 100 gal./ac. of water under nursery crops, wetting of crop foliage being avoided except with Formosa azalea and Pfitzer juniper. Though no plants were killed, 30 lb./ac. caused moderate to severe necrosis in Pfitzer juniper, *Magnolia grandiflora* and Formosa azalea; a soil application at this rate to mimosa caused epinasty and necrosis. Rates of 10 and 15 lb./ac. gave 95–98% control of bermuda grass [*Cynodon dactylon*] and did not injure *Quercus virginiana, Magnolia grandiflora, Pinus caribaea, Juniperus communis pfitzeriana*, Formosa azalea, *Cornus florida, Podocarpus macrophylla, Ilex opaca, I. cornuta burfordi, Albizzia julibrissin, Lagerstroemia indica*; only *Nandina* suffered any injury.—S.W. Inst., Lafayette, La.—*Weed Abstr.*, **8**, No. 1244.

3520. BING, A.
The latest on gladiolus weed control.
Bull. N.Y. St. Flower Grs, 1959, No. 159, pp. 1–2, bibl. 2.

At Cornell Ornamentals Research Laboratory the following treatments gave good weed control in gladiolus: monuron (1½ lb./ac.), neburon (6 lb./ac.), diuron (1½ lb./ac.), 4% CIPC + 4% Sesone granular (150 lb./ac.), CIPC (8 lb./ac.), 6% CIPC + 5% Sesone granular (100 lb./ac.), diuron 2% granular (100 lb./ac.) and simazine (2 lb./ac.). Diuron is considered to be the most effective herbicide and has been successfully used at rates from ¾ lb. to 2 lb. of active ingredient before emergence; at the lower rate it has also been applied during growth. Materials suggested for trial use are tabulated.

3521. HOOGETERP, P.
Welk middel gaat U toepassen bij de bestrijding van onkruiden in gladiolen? **(What material will you use for weed control in gladiolus?)**
Weekbl. BloembollCult., 1959, **69**: 708, 716.

High volume sprays were better than concentrate sprays, chiefly because there was less danger of drift. CIPC applied alone was disappointing for general weed control. Combinations of CIPC with MCPA or PCP are recommended for use in gladiolus. Yields from an unweeded plot were 40% lower than those from a hand-weeded plot of gladiolus.—R.T.C. and Proefst. Bloemboll., Lisse.

3522. VAN WINDEN, W. P.
Onkruidbestrijding met chemische middelen in fresia's. **(Chemical weed control for freesias.)** [English summary 14 lines.]
Meded. Dir. Tuinb., 1959, **22**: 212-18, bibl. 10, illus.

Pre-emergence sprays of PCP oil (30–40 l./ha.) gave good weed control without injury to freesia or gladiolus crops, but with aromatic oils (1 l./10–12 sq. m.) results were less good. Results with hormone weed-killers were not promising. Both IPC and CIPC gave satisfactory weed control, but CIPC is preferred, as it is less easily translocated in the soil. CIPC may be used before and after emergence with freesia corms, but with seedlings it should only be used after emergence. A suggested programme is PCP-oil application just before emergence, followed if necessary by CIPC when the plants are 4–10 cm. high.—Proefst. Groent. Fruit. Glas, Naaldwijk.

3523. WOOD, J., AND HOWICK, S. J.
Experiments with herbicides on beds of narcissus and tulip 1955-58.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 8, bibl. 2.

Pre-emergence (mid-November 1955 and early December 1956) treatments of King Alfred narcissus with the following chemicals increased yields above the hand-weeded control: CIPC at 4 and 8 lb./ac., DNC at 12 lb./ac., dinoseb at 8 lb./ac., PCP at 16 lb./ac. ± cultivation, sulphuric acid 12·5% (100 gal./ac.) ± cultivation, white oil and vaporizing oil 80–100 gal./ac. The following chemicals decreased yields: arsenic trioxide (As_2O_3) at 9·8 lb./ac., cultivation alone and monuron at 4 lb./ac. In the 1956/57 treatments, a slight delay in flowering was caused by monuron, CIPC, DNC and dinoseb, but, except in the case of monuron, the flowers were of good quality. Further trials are reported using PCP, CIPC and As_2O_3, pre-emergence and post-emergence, on narcissi and tulips. As_2O_3 and PCP were quickly effective, and several weeks later CIPC was giving excellent control of all weeds in tulip plots and of all except *Matricaria maritima* sub-sp. *inodora* in narcissus plots; however, excellent control of this weed was obtained when CIPC at 2 lb./ac. followed As_2O_3. CIPC at 4 lb./ac. in April was found to cause irregularity of stem length in tulips, and scorching of leaves at soil level in narcissi. Post-emergence diuron and neburon caused injury to tulips (var. Wm. Pitt), and control of weeds was poor. With fenuron and simazine there was no obvious injury, and King Alfred narcissus also showed tolerance to them at 2 lb./ac. [For earlier work see *H.A.*, 27: 3363.]—Kirton Exp. Husb. Fm, Lincs.—From *Weed Abstr.*, **8**, No. 981.

3524. Anon.

Eradication of crabgrass in lawns.

Okla. Fm Res. Flash, March 1959, p. 2.

On an established Bermuda grass turf good to excellent control of crabgrass was obtained in late summer by two applications at 4 lb. per acre of DSMA.

Weed control in tropical and sub-tropical crops.

(*See also* 3542f, 4054.)

3525. Burt, E. O., and McCown, J. T.

Controlling perennial grasses in citrus groves.

Proc. 12th south. Weed Conf., 1959, pp. 93-9.

Oranges and tangerines were resistant to dalapon at 8·5 lb./ac., diuron at 12·8 lb./ac. and simazine at 10 lb./ac. in several trials in different parts of Florida. Grapefruit was tolerant of simazine and diuron, but rather sensitive to dalapon. Symptoms of toxicity caused by dalapon and diuron are described. *Panicum hemintomon* and *Cynodon dactylon* proved susceptible to repeated treatment with dalapon. About 6–9 lb./ac. of diuron were needed for grass control; *Petiveria alliacea* was also fairly resistant to diuron.—Fla agric. Exp. Stat., Gainesville.—*Weed Abstr.*, **8**, No. 1253.

3526. Robinson, J. B. D.

Chemical weed control in coffee.

Progr. tec. Prod. Café, [?1958], 149-58, and *Coffee and Tea Ind.*, 1958, **81**(11): 100-1, 103, 105, bibl. 41.

A brief review, including information from Colombia, Central America, Hawaii, India, Tanganyika and Brazil. Mulching is a standard practice in Jamaica and has obviated the need for chemical weed control. In Hawaii a mulch of coffee parchment, flat stones, or grass is used to suppress weeds. A graph is included which shows the influence of mulches on the cost of chemical weed control.—Dep. Agric., Kenya.—From *Weed Abstr.*, **8**, No. 1256.

3527. Macalpine, R. I.

A note on "*Mikania scandens*".

Two and a Bud, 1959, **6**(1): 6-8.

This serious creeping weed, probably *M. cordata*, is invading tea areas of W. Bengal. Chemical weedkillers are not recommended owing to the danger of harming tea plants. Physical eradication is laborious and expensive. A note on the botany of the plant is appended.

Weed control in vegetables.

(*See also* 3494, 3495, 3497, 3542e, g, l.)

3528. Orsenigo, J. R.

Pre-emergence performance of several herbicides and vegetable and field crop response on organic soil.

Proc. 12th south. Weed Conf., 1959, pp. 59-66.

(1) CDAA at 3 and 6 lb./ac., (2) CDEC at 3 and 6 lb./ac., (3) dalapon at 5 lb./ac., (4) dinoben (2,5-dichloro-3-nitrobenzoic acid) at 4, 8 and 12 lb./ac., (5) dinoseb at 6 lb./ac. and (6) monuron at 1·5 lb./ac. were applied the day after sowing. In the crops specified, the following gave promising results at 1 or more rates: EES No. 148 celery (treated day after transplanting)—all compounds; Chantenay carrot—2, 3, 4 and 6; Homestead tomato—1, 2, 3, 4 and 6; Florida Giant pepper—all compounds; Va. B. R. Savoy spinach—4 and 6; F. H. Batavian endive—2, 4 and 6; Parris Is. Cos and Boston lettuce—2, 3, and 6; Texas E. Grano onion—1, 2, 4 and 6; Scarlet Globe radish—1 and 4; Michihli Chinese cabbage—1, 2 and 4; Badger Market cabbage—1 and 4; Marketer cucumber—2, 3, 4 and 5; Early Wonder beet—4; Crowder peas—1, 2, 4, 5 and 6; Contender and Tender Green snapbeans—all compounds. The main weeds *Amaranthus spinosa* and *Digitaria* sp. were controlled by 2 and 3 and by 3 respectively.—Everglades Exp. Stat., Fla.—From *Weed Abstr.*, **8**, No. 1243.

3529. Collins, W. B.

Chemical weed control. Horticultural crops.

Progr. Rep. exp. Fm Fredericton, N.B., 1953-7, 1959, pp. 43-4.

The amine formulation of DNOSBP (Dow Premerge) gave excellent weed control when applied pre-emergent to peas, beans and sweet corn at 4 lb. active material in 50 gal. water per acre. Other materials showing promise were neburon, Mylone and simazine, but the last two were toxic to beans. In trials with newly set strawberries, of 12 materials tested during the past 5 years SES (Crag Herbicide No. 1) was effective when applied early in the planting year at rates of 2 to 4 lb. in 50 gal. water per acre. It should not be used when the plants are setting runners during fruit bud differentiation. Other promising, but insufficiently tested, materials were EPTC and VPM.

3530. Coomans, A.

Les désherbages des asperges au moyen de cyanamide calcique. (**Weed control in asparagus by calcium cyanamide.**)

Courr. hort., 1959, **21**: 244-5, illus.

Excellent weed control was obtained when 3 kg. calcium cyanamide per are was applied during cutting in May. One or two applications in July may also be necessary.

3531. Roberts, H. A.

Annual weed control in established asparagus with monuron.

Paper read at *4th Brit. Weed Control Conf., 1958*, reprinted in *Pest Technol.*, 1959, **1**: 180, bibl. 8.

Monuron at 4 lb./ac. applied to asparagus before spear emergence for 4 successive years had no effect on appearance, yield, earliness, or quality. A rate of 2 lb./ac. gave effective control of *Urtica urens*, *Poa annua*, *Senecio vulgaris* and *Capsella bursa-pastoris*, but not of *Fumaria officinalis* or *Veronica* spp., notably *V. persica* which flowered and produced seed. Soil from the 2 lb./ac. plots showed a threefold increase in viable seed of *V. persica* and a threefold decrease of all other species. At 4 lb./ac. it had little effect on established *Convolvulus arvensis* and *Cirsium arvense*, but reduced establishment of *Agropyron repens*, particularly with rhizomes near the surface. On a sandy loam 2 lb./ac. showed no toxic effects after 8 months; 4 lb./ac. was detected after 14 months.—Nat. Veg. Res. Stat., Wellesbourne.—*Weed Abstr.*, **8**, No. 1241.

3532. Coiteux, F., and Bordeleau, R.
L'usage des herbicides dans le Québec. (**Herbicide practice in Quebec.**)
Rev. d'Oka, 1959, **33**: 1-6.

Trials at the Government Experimental Station of Assomption indicate that Endothal at 2·5 lb. + CDAA at 8·0 lb./ac. affords excellent weed control for garden beet crops. Endothal + CP 1815 and Endothal + EPTC are also promising.

3533. Reynolds, J. D.
A guide to weed control in peas.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 10, bibl. 12.

A review dealing with cultural and chemical weed control in peas. The last half gives practical notes on cultural control and the use of dinoseb, MCPA, MCPB, propham and TCA.—Pea Growing Res. Stat., Yaxley.—*Weed Abstr.*, **8**, No. 975.

3534. Proctor, J. M., and Armsby, W. A.
Experiments on the control of wild oats in peas: progress report, 1957-58.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 12, bibl. 6.

Results are given of 6 detailed experiments and 28 observation plots in which pre-sowing applications of TCA, propham, CDAA and CDEC were made for the control of wild oats [*Avena fatua*] in peas. CDAA and CDEC were less selective than the other herbicides. The authors consider that, where maximum selectivity is required, propham should be used, but that, where maximum effect on wild oats is needed, TCA is to be preferred. The following varieties appear to be comparatively resistant to TCA: Dark Skin Perfection, Gregory's Surprise, Kelvedon Wonder, Lincoln, Meteor, Onward, Pondo, Thomas Laxton, Victory Freezer and Witham Wonder, while Zelka consistently showed damage. TCA appeared to render the crop more susceptible to downy mildew. Propham gave the best results when applied rather later than TCA. [For earlier work see *H.A.*, 27: 3393.]—Pea Growing Res. Stat., Yaxley.—*Weed Abstr.*, **8**, No. 977.

3535. Butler, A. J.
Chemical control of wild oats by pre-sowing treatments.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 6, bibl. 2.

In 6 trials in peas and sugar beet 4 compounds were incorporated in the soil 2–6 weeks before sowing. TCA at 7·5 lb./ac. gave 71–98% control of wild oats [*Avena fatua*]; propham at 2 lb./ac. 9–70%, 4 lb./ac. 63–92% and 8 lb. /ac. 72–99%; CIPC at 2 lb./ac. 67–86%, 4 lb./ac. 61–98%; CDEC at 4 lb./ac. 0–47%, 8 lb./ac. 12–85%. When peas were sown 15 days after treatment, only propham at 2 and 4 lb./ac. and CDEC caused less than a 10% reduction in vigour; sown 27 days after treatment only TCA and CIPC at 4 lb./ac. caused more than a 4% reduction in vigour, and when sown 42 days after treatment only TCA and CIPC at 2 lb./ac. caused more than an 8% reduction in vigour.—Fernhurst Res. Stat.—From *Weed Abstr.*, **8**, No. 1087.

3536. Goodman, O. G.
Use of dinitro-compounds for pre-emergence weed control in peas.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 7, bibl. 2.

Briefly reports experiments which suggest that dinoseb (ammonium) at about 4 lb./ac. + TCA up to 15 lb./ac. or DNC (sodium) up to 9 lb./ac. may be applied any time between sowing peas and about 3 days before emergence without reducing crop yields. Good control of broad-leaved weeds and 50% control of *Poa annua* was obtained. The advantages over post-emergence spraying are given as (1) less risk to crop, (2) less competition, (3) greater independence of weather, and (4) the possibility of combining weed control and sowing. —*Weed Abstr.*, **8**, No. 976.

3537. Roberts, H. A.
Evaluation of dinoseb for the control of annual weeds in market-garden peas.
Exp. Hort., 1959, No. 2, pp. 19-25, bibl. 10.

Comparison of the amine and ammonium salts of dinoseb showed that both controlled the same weed species, but that the amine salt was slightly less effective, and also less phytotoxic, than the ammonium salt. Peas were sprayed with the amine salt from emergence up to the expansion of 3 leaves without injury. In general, there was little difference in varietal response to dinoseb (amine) application at rates up to 3 lb./ac. In some cases pea yields were significantly higher with dinoseb sprays than after inter-row cultivation.—Nat. Veg. Res. Stat., Wellesbourne.

3538. Saunders, C.
Weedkillers in New Zealand.
World Crops, 1959, **11**: 179-83, bibl. 7, illus.

To control weeds in peas DNBP at 0·6 to 0·8 lb./ac. or MCPB at 1·25 lb. is used. MCPB is preferred where creeping thistle (*Cirsium arvense*) or Prince of Wales' feather (*Amaranthus* spp.) are prevalent, but some doubt remains as to whether MCPB may not taint the final canning product. Among things still wanted is reliable chemical control for sweet briar, gorse and broom that does not depend too much on complete coverage for good results.

3539. Pearce, G. A.
Weed control in peas.
J. Agric. W. Aust., 1959, **8**: 21-3.

Trials on field and canning peas, involving 13 treatments, showed that early germinating weeds could be controlled by applying, 2 to 3 days before the peas emerged, sprays of 4 oz. acid equivalent of MCPA or 2,4-D amine plus ½ gal. 16% DNBP per acre. A later treatment may be necessary when the peas are 4 to 8 in. high. This should consist of 1 gal. 16% DNBP applied in at least 50 gal. water. All treatments caused considerable damage to the variety Canners' 75. Most treatments except DNBP caused some damage to Dunn's Field peas.

3540. Menges, R. M.
Weed control in onions with pre-emergence applications of herbicides.
Proc. 12th south. Weed Conf., 1959, pp. 73-80, bibl. 6.
Menges, R. M., and Danielson, L. L.
Help for truck crops.
Agric. Res. Wash., 1959, **7**(10): 16.

In 3 experiments, in which the main weeds were *Amaranthus palmeri* and *Echinochloa colonum*, CDEC at 3–4 lb./ac. gave satisfactory weed control without injury to the crop (Crystal Wax onions); CIPC at 3–8 lb./ac., EPTC at 3–6 lb./ac. and CDAA at 3–6 lb./ac. caused no yield reduction, but failed to give adequate weed control; monuron and diuron at about 0·5 lb./ac., neburon, tris (2,4-dichlorophenoxyethyl) phosphite at 5 lb./ac., 2-dichloro-4,6-bis (diethylamino)-s-triazine at 4 and 6 lb./ac. and 3,4-dimethylbenzophenone at 12 lb./ac. were damaging to the crop.—U.S. Dep. Agric., Weslaco, Texas.—*Weed Abstr.*, **8**, No. 1239. The second paper confirms the value of 3 lb./ac. of CDEC, but mentions that 6 lb./ac. decreased the stand of onions.

3541. Menges, R. M.
Chemical weed control in established tomatoes.
Proc. 12th south. Weed Conf., 1959, pp. 81-7, bibl. 1.

In an experiment in 1957 yields of Rutgers Improved tomatoes, treated in the early flower stage, were not reduced significantly by 5 herbicides, but were reduced by 7 others. In 1958 granular applications were made to Homestead tomatoes and either left on the surface of the soil or rototilled into the top 3 in. With surface applications yields were not reduced significantly by CDEC at 8 lb./ac. or diuron at 0·75 lb./ac., but were reduced by CIPC at 8 and 12 lb./ac., EPTC at 6 and 8 lb./ac., diuron at 1·5 lb./ac. and simazine at 1·5 lb./ac.; when incorporated with the soil all treatments reduced yields significantly, except CDEC at 6 and 8 lb./ac. Only in the cases of diuron and simazine did soil incorporation improve grass control.—U.S. Dep. Agric., Weslaco, Texas.—From *Weed Abstr.*, **8**, No. 1237.

Noted.

3542.

a Berg, A.
Analyse des conditions impropres au développement de la jacinthe d'eau *Eichhornia crassipes* (Mart.) Solms dans certaines rivières de la cuvette congolaise. (**Studies of conditions unfavourable to growth of water hyacinth in certain rivers of the Congo basin.**) [Flemish summary 3 pp.]
Bull. agric. Congo belge, 1959, **50**: 365-93, bibl. 6, illus.
Water hyacinth would not grow if the pH was lower than 4·2.

b Cooreman, J.
Tetranychus telarius (Linné) (Acari, Tetranychidae) parasite de la jacinthe d'eau, *Eichhornia crassipes* Mart. (***Tetranychus telarius*, a parasite of water hyacinth.**) [Flemish summary ½ p.]
Bull. agric. Congo belge, 1959, **50**: 395-401, bibl. 10, illus.
Possible biological control.

c Davis, D. E., Funderburk, H. H., and Sansing, N. G.
Absorption, translocation, degradation and volatilisation of radioactive simazin.
From abstr. in *Proc. 12th south. Weed Conf., 1959*, pp. 172-3.
The test plants included cucumber [see *Weed Abstr.*, **8**, No. 1372].

d Gard, L. N., Ferguson, C. E., Jr., and Reynolds, J. L.
Effect of higher application rates on crop residues of isopropyl *N*-phenylcarbamate and isopropyl *N*-(3-chlorophenyl) carbamate.
J. agric. Food Chem., 1959, **7**: 335-8, bibl. 5.
Residues in celery, peas, strawberries, spinach and beans less than 0·05 p.p.m.

e Hall, B. J.
Chemical control of weeds in vegetables.
Agric. Gaz. N.S.W., 1958, **69**: 606-8.
General recommendations for the main vegetable crops.

f HATTINGH, E. R.
A survey of certain weed control problems in Africa south of the Sahara.
Pest Technol., 1959, **1**: 172-7, bibl. 27.
With special reference to such crops as coffee and sugar cane and such weeds as nutgrass and water hyacinth.

g HUBERT, K.
Chemische Unkrautbekämpfung im Gemüsebau. (**Chemical weed control in vegetables.**)
Dtsch. Gartenb., 1959, **6**: 127-9, bibl. 10.
A review, with special reference to Hedolit and certain other herbicides marketed in E. Germany.

h KATES, A. H., AND OTHERS.
Chemical weed control guide for Virginia.
Circ. Va agric. Exp. Stat. **728**, revised 1959, folder.
Recommendations for weed control in vegetables, fruits, ornamentals, etc., tabulated.

i KÖPPÄ, P.
Soveltuuko kemiallinen rikkaruohojen torjunta puutarhaviljelyksille? (**Can herbicides be used in horticulture?**)
Puutarha, 1959, **62**: 202-3, illus.
In Finland no suitable herbicide yet found for strawberries or for vegetables other than carrots and onions.

j LEASURE, J. K.
A logarithmic concentration sprayer for small plot use.
Weeds, N. York, 1959, **7**: 91-7, bibl. 2, illus.
See *H.A.*, 29: 1071.

k MEURMAN, O.
Vieläkin kloraateista rikkaruohomyrkkyinä. (**Chlorates as herbicides.**)
Puutarha, 1959, **62**: 213.
A potassium chlorate preparation used for 15 years in orchards without damage to trees.

l SMITH, L. W.
Weed control, recent developments. Weeds in lucerne and peas.
Tasm. J. Agric., 1959, **30**: 26-30, bibl. 11, illus.
MCPA was inadequate; dinoseb and MCPB are discussed.

m STADTHERR, R. J., AND WIDMER, R. E.
Chemical weed control in garden chrysanthemums.
Weeds, N. York, 1959, **7**: 82-7.
See *H.A.*, 28: 3594.

n STEFANYE, D., AND DE ROSE, H. R.
Comparative herbicidal activities of carbamates and *N*-substituted derivatives.
J. agric. Food Chem., 1959, **7**: 425-7, bibl. 8.

o WOOD, C. A., AND SUTHERLAND, J. P.
Preliminary trials of weedkillers in raspberry cane nurseries.
Paper read at *4th Brit. Weed Control Conf., 1958*, pp. 5, bibl. 17.
See *Weed Abstr.*, **8**, No. 982.

VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE.

General.

(*See also* 3119, 3204g, 3248, 3722t, 3723a-c, j, m, n, 4138, 4144, 4152, 4162g.)

3543. WELLESBOURNE.
Ninth Annual Report of the National Vegetable Research Station, Wellesbourne, 1958, 1959, pp. 54.

Plant breeding: brussels sprouts, peas, spring cabbage, early summer cauliflower, asparagus (supermale plants giving all-male progenies), tomatoes, celery. *Chemistry:* N fertilizers for leeks and cabbage; fertilizer trials with lettuce, carrots and runner beans; organic constituents of red beet roots in relation to flowering; chemical factors affecting pea seed germination. *Plant physiology:* weed competition; pea and carrot spacing; carrot growth in relation to manuring; growing pickling onions and onion sets; environmental effects on onion seed germination; a late-flowering strain of water-cress; the effect of gibberellic acid on flowering of vegetables and growth of rhubarb and seakale. *Irrigation:* irrigation and growth studies of cauliflower; irrigation of summer lettuce and rotation of crops; factors affecting set of runner bean pods. *Entomology:* natural control of cabbage root fly; control of carrot fly; carrot fly on parsnips; lettuce root aphid; pea moth; bioassay of insecticides in soil and plant tissue. *Plant pathology:* silvery disease of red beet, didymella stem rot of outdoor tomatoes; parsnip canker; clubroot of brassicas; leaf and pod spot of peas; big vein disease of lettuce; powdery mildew diseases; rhizoctonia damping-off and wirestem of brassicas. *Weed investigations:* ecology; chemical control; spray drift.

3544. YEAGER, A. F., AND MEADER, E. M.
Breeding new vegetable varieties.
Bull. N.H. agric. Exp. Stat. **440**, 1957, pp. 33, illus.

Brief descriptions are given of new varieties of beans, beetroot, brassicas, carrots, eggplants, melons, capsicums, swedes, squash, tomatoes and watermelons.

3545. GUMPENSTEIN (KARNER, L.).
Ergebnisse der Sonderkulturen-Versuche des Jahres 1958. **(Results of variety trials with vegetables and other crops at Gumpenstein in the year 1958.)**
Versuchsergebn. Bundesversuchsanst. alpenländ. Landw. Gumpenstein **46**, 1959, pp. 78, illus.

The varietal performance, under alpine conditions, was studied of the following vegetables: cabbages, savoys, red cabbages, cauliflowers, kohl-rabi, lettuces, spinach, carrots, beetroot, radishes, black radishes, parsley, peas, dwarf and runner beans, paprika, tomatoes and onions. Trials with oil poppy varieties, mixed cultures of vegetables, and several medicinal plants were also carried out.

3546. CHENG, C. C., AND OTHERS.
The proceedings of vegetable seminar. [Chinese, with English summaries.]
Spec. Publ. Coll. Agric., nat. Taiwan Univ. **7**, 1958, pp. 113.

Present practices in vegetable growing, marketing and seed production in Taiwan, and methods suggested for improving them in the future, were discussed in 16 papers, reproduced here. Much emphasis is placed on the need for increasing the production of Western-type vegetables, for which it is difficult to establish local seed supplies because of climatic conditions.

3547. HEYDECKER, W.
Stand of seedlings as an index of soil quality.
A.R. Nott. Univ. Sch. Agric. 1958, 1959, pp. 31-3.

Seeds of lettuce, cabbage, carrot and onion were sown in test soils, which were then wetted either by immersion of the containers up to their rims, or by capillarity, when only the base of the containers stood in water. Each wetting treatment was followed by covering the soil surface to prevent evaporation, either immediately or after a certain amount of water had been lost. The percentage emergence, together with chemical analyses, was used as an indication of soil character.

3548. GOLYATINA, T.
Growing vegetables in nutrient solutions. [Russian.]
Nauk, Mosk., 1958, No. 3, p. 31, illus., from *Agric. hort. Engng Abstr.*, 1959, **10**, Abstr. 213.

The lay-out and operation of a large glasshouse used for the hydroponic cultivation of cucumbers and tomatoes are described. In this building experiments were carried out comparing the efficiency of growing crops in reinforced-concrete basins coated with asphalt enamel containing seed-beds of gravel, fine brick chippings, wood shavings, sand and moss, with a control plot of soil. The nutrient solution was gravity fed into the basins from 1,200-litre tanks. The highest yields were obtained from plants grown in moss and gravel.

3549. FRÖHLICH, H.
Fragen der zusätzlichen Wasserversorgung im feldmässigen Frühgemüsebau. **(On the irrigation of field-grown early vegetables.)** [Russian and English summaries about 13 lines each.]
Arch. Gartenb., 1959, **7**: 175-94, bibl. 17, illus.

Irrigation experiments were carried out with early vegetables, viz. lettuces, cabbages and peas, with special reference to plant growth, earliness, quality and yield. The results are tabulated or presented graphically. On the whole, pod-bearing vegetables, such as peas, demanded a decrease in soil moisture before flowering and an increase thereafter, whereas with leafy vegetables, such as lettuce, the soil moisture should not be allowed at any time to drop below 65% of field capacity. Measurements of the soil temperature at various depths showed that the moist layers were colder than the dry layers.—Inst. Gartenb., Grossbeeren.

3550. CAROLUS, R. L.
Now northern growers can grow vine crops at a profit.
Amer. Veg. Gr, 1959, **7**(3): 13, 42-3, illus.

Mulching melons and summer squashes with black plastic resulted in marked yield increases. The responses of tomatoes, capsicums and eggplants were less marked, but yield increases were also recorded.—Mich. St. Univ., E. Lansing.

3551. VOGEL, G.
Untersuchungen über den Einfluss der Bodenheizung im Freiland mittels Dampf auf die Frühzeitigkeit und Höhe des Ertrages der wichtigsten Gemüsearten. **(Studies on the effect of soil heating by steam on earliness and yields of the more important vegetables grown in the field.)** [Russian and English summaries 11 and 8 lines.]
Arch. Gartenb., 1959, **7**: 208-40, bibl. 18, illus.

Soil heating markedly increased earliness and yields in lettuce, cauliflower, radish, kohl-rabi and spinach in the spring, and in cucumber, tomato and paprika in the summer. The installation of soil heating in the field was most profitable for lettuce and cucumber, followed by kohl-rabi, paprika, cauliflower, radish, tomato and spinach. The optimum temperature of the soil in the open was determined for cucumber, lettuce and cauliflower.—Inst. f. Gartenb., Grossbeeren.

3552. NAIR, G. G. K., AND MEHTA, B. V.
Studies in zinc deficiency symptoms in some common crops of Gujarat (India).
J. agric. Sci., 1959, **52**: 396-401, bibl. 19.

The plants were grown in sand culture at Zn levels ranging from 0 to 50 p.p.m. in the nutrient solution. For guar (*Cyamopsis psoraloides*) the optimal level was 1 p.p.m., growth, colour and pod production being poorer at other levels. No seeds were formed in the absence of Zn. Eggplants grew and fruited best at 2 p.p.m. and *Nicotiana rustica* at 1 p.p.m. (although very satisfactory results were also obtained at 2 p.p.m.). Of the 3 levels (0, 1 and 2 p.p.m.) provided for mosambi (*Citrus sinensis*) the highest gave excellent, and the medium good, results. Deficiency symptoms are described for each crop.

3553. Kobel, F., Krapf, B., and Schütz, F.
Düngungsversuche mit Gemüsearten—I. und II. Teil. **(Manurial trials with vegetables. I and II.)**
Schweiz. GartenBl., 1958, **79**: 953-4, 977-80, 1216-17, 1239-40, and 1959, **80**: 7-9, from abstracts in *InformDienst Weihenstephan*, 1959, No. 5, pp. 67-8.

The vegetables were grown in a mixture of peat, sand and poor soil at pH 6 in 6-l. Mitscherlich pots, and supplied with NPK mixtures and certain minor elements. Of the NPK [presumably $N:P_2O_5:K_2O$] ratios tested, that of 2·5:1·5:3 was optimal for radish, tomato and bean yields, and almost so for spinach, but endive gave better results with 2:3:4 or 2:4:4, as also did beans when grown for seed. Doubling the fertilizer application, based on 0·38 g. of N per pot for radishes and 1 g. for the other crops, significantly increased yields, except with endive. Spinach showed a high requirement for B, and endive yields were also reduced at low B levels, though without the manifestation of deficiency symptoms. For kohl-rabi 2·5:6:6, and for lettuce 2·5:2·5:3, were the best major-nutrient ratios. Lettuce was highly sensitive to deficiency of K or Mg, but B and Zn appeared unimportant. In excess, P induced bolting, N and K gave loose hearts, and lime delayed maturity, whereas 4·5 was a satisfactory pH. Tomato leaf colour became abnormal and fruit yield was reduced by excess of N. In this crop the effects of deficiency of Ca, B and Zn were negligible.

3554. Pisani, P. L.
Osservazioni sulla influenza esercitata dalle gibberelline sulla germinazione dei semi di alcune specie da orto. **(The effect of gibberellin on seed germination in certain vegetable species.)**
Riv. Ortoflorofruttic. ital., 1959, **43**: 157-63, bibl. 18.

The application of gibberellin in a 10 p.p.m. water solution to seeds of spinach, eggplant, lettuce, radish, marrow, bean, carrot, basil and onion had favourable effects on the speed and amount of germination in eggplants only. It is thought that the actual effect may either have been to stimulate hard seeds into germination or possibly to quicken the process of germination and so allow the seed to avoid insect damage. Its practical application for this purpose seems unlikely.

3555. Mazzani, B., and González, O.
Resultados de experimentos preliminares con ácido giberélico en ajonjolí, caraota, tomate y lechosa. **(Results of preliminary experiments with gibberellic acid on sesame, bean, tomato and papaw.)**
Agron. trop. Venezuela, 1958, **7**: 175-89, bibl. 5, illus., from *Trop. Abstr.*, 1959, **14**, No. g 1168.

Germination of sesame, bean, tomato and papaw seeds was unaltered by seed treatment with gibberellin, but seedling growth was accelerated and seedling heights were roughly proportional to the concentration of gibberellin, which caused elongation of the internodes. Repeated treatments had cumulative effects, and very high concentrations were phytotoxic.—Cent. Invest. agron., Maracay.

3556. Mosolova, L., Komissarov, V., and Demčinskaja, M.
The effect of gibberellic acid on vegetable crops. [Russian.]
Sad i Ogorod, 1959, No. 4, pp. 30-1, illus.

Gibberellic acid sprays increased the growth of several vegetable crops but had no effect on perennial multi-tiered onion, garlic or cabbage. Spraying the tomato variety Greater Baltimore with G.A. at 100 mg./l. increased stem height and number of trusses but produced smaller, seedless fruits.

3557. Thomas, W. O.
Soil sterilants for use in seedbeds.
Miss. Fm Res., 1958, **21**(12): 2.

In 1957 an old greenhouse soil, highly contaminated with damping-off organisms and weed seeds, was treated with the soil sterilants Vapam, Bedrench and Mylone W-50. After 20 days measured quantities of tomato, cabbage, pepper and lettuce seeds were sown in replicated plots in the treated areas. In non-sterilized soil five fungicides, Dithane M-22, Dithane D-14, Arasan-75, Dyrene and Semesan Bel, were applied after sowing. In 1958 the trials were repeated with two more sterilants, 4417 (Niagara) and Mylone as a dry powder, but without the fungicides which had proved less successful. Counts of seedling stands on the sterilized plots were mostly significantly higher than those on the controls.

3558. Shimokawa, M., and others.
Experiments on soil fumigation with methyl bromide. No. 2. (3) Effect on some soil-borne pathogens of vegetables and ornamental plants. [Japanese, with English summary ½ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1957, No. 5, pp. 61-8, bibl. 11, illus.

Methyl bromide at 2 c.c. per cu. ft. of soil killed *Rhizoctonia* spp., including *solani*, and *Corticium* sp., even in the sclerotial phase. *Xanthomonas campestris* and *Pseudomonas solanacearum* were considerably more resistant. Survival of green gram sown in soil contaminated with *Rhizoctonia* sp. was 5–15%, but pre-sowing fumigation at 5–15 c.c. per cu. ft. raised survival to 75–92%. When soil was treated with methyl bromide at 2·5 c.c. per cu. ft., contamination by *P. solanacearum* was reduced from 100% to 40–60%, and at double this application rate it fell to 20–40%. Diffusion of the fumigant was not affected by soil temperature or moisture content. [For other papers in this series see *H.A.*, 27: 1066 and abstract 3493 in this number.]

3559. Young, J. R., and Ditman, L. P.
The effectiveness of some insecticides on several vegetable crops.
J. econ. Ent., 1959, **52**: 477-81, bibl. 1.

Six insecticides were tested on vegetables for phytotoxicity, effectiveness against insects and effects on flavour and quality. At rates below those usually recommended, Thiodan, ethion, malathion, Dibrom, Sevin and Trithion showed no phytotoxicity to cucumber, cantaloupe, tomato, snap and lima beans, cabbage and eggplant. Yields of eggplant and cabbage were significantly increased by Thiodan, ethion, malathion, Dibrom and Trithion, and yields of cabbage were significantly increased by Sevin. The effectiveness of the insecticides against 13 insects and one mite is summarized. No off-flavour was detected in any of the crops. [From authors' abstract.]—Md agric. Exp. Stat., College Park.

3560. Pote, H. L.
Tetrin, a new antifungal antibiotic.
Diss. Abstr., 1959, **19**: 2778, being *L.C. Card No. Mic.* 59-558 of 123 pp.

Tetrin, synthesized by a streptomycete, inhibits filamentous fungi and yeast, but not bacteria. Foliar sprays of tetrin (at 1,000 mcg. per ml.) were not toxic to tomato, beet, broccoli, radish and pea plants. The incidence of asparagus rust (*Puccinia asparagi*) was, however, increased by application of the antibiotic.—Univ. Ill.

3561. Mehta, P. P., Gottlieb, D., and Powell, D.
Vancomycin, a potential agent for plant disease protection.
Phytopathology, 1959, **49**: 177-83, bibl. 18.

In vitro this antibiotic (from *Streptomyces orientalis*) proved very active against widely different types of bacteria, with outstanding control of *Corynebacterium* spp. Details are given of its absorption by plants from sprays, from solutions and from the soil, and by seeds immersed in solutions, also of its translocation within the plants, and its inactivation in plants and soil. Test plants included capsicum, cucumber, eggplant, pea, tobacco, tomato and watermelon, all of which were unharmed by concentrations up to 1,000 µg./c.c.—Agric. Exp. Stat., Univ. Ill., Urbana.

3562. Wallis, R. L., and Carter, R. H.
Methoxychlor residues on vegetable crops.
J. econ. Ent., 1959, **52**: 232-3.

Methoxychlor was applied to vegetables in small field plots at Beltsville, Md, at 1¾ lb./acre in dusts and in wettable-powder and emulsion sprays, and also at 3 or 3½ lb./acre in wettable-powder sprays. Residues determined at intervals appeared to justify a waiting period of only 1 day from the last application to harvest for summer and winter squash, cantaloupes, eggplants, pumpkins, peppers, tomatoes, kohlrabi, turnip roots and strawberries, at the present tolerance level of 14 p.p.m. For okra an additional 1-day waiting period is needed and for green onions 3 days. [From authors' abstract.]—Agric. Res. Serv., U.S.D.A.

3563. White, A. R.
Observations on slug activity in a Northumberland garden.
Plant Path., 1959, **8**: 62-8, bibl. 4.

A study on the slug population in a garden, made at weekly intervals throughout the year, showed that 8 species were present, the dominant species being *Milax budapestensis*. The species showed marked differences in seasonal activity, and in preference for lawns or cultivated land. Slug activity ceased when the temperature fell below freezing point.—Royal Grammar School, Newcastle.

3564. Ruppel, R. F.
Effectiveness of Sevin against the grey garden slug.
J. econ. Ent., 1959, **52**: 360, bibl. 2.

In recent tests in Colombia, baits of 1·25 to 2·50% Sevin mixed with 2·50% metaldehyde and sprays of 0·25% Sevin mixed with 0·25% metaldehyde proved to be effective against the grey garden slug, *Deroceras reticulatum*, and also against the greenhouse slug, *Milax gagates*.—Colomb. Dep. agric. Res. and Rockefeller Found.

3565. Ezell, B. D., and Wilcox, M. S.
Loss of vitamin C in fresh vegetables as related to wilting and temperature.
J. agric. Food Chem., 1959, **7**: 507-9, bibl. 9.
Maintaining vitamin C content of vegetables.
Agric. Mktg, 1959, **4**(2): 4.

Kale, collards, turnip greens, spinach, rape, cabbage and snap beans were subjected to slow, moderate and rapid wilting (moisture loss) at 32°, 50°, 70° or 75° F. Rapid wilting and high temperatures increased the rate of loss of vitamin C. Loss of vitamin C was always less affected by humidity than by temperature, but the ascorbic acid content of leafy vegetables was more affected by humidity than was that of beans. Beans lost moisture slowly and differences in ascorbic acid content between lots stored under different wilting conditions were only significant at 32° F., possibly as a result of chilling injury. Kale wilted rapidly, and lost 1·5% of its total vitamin C content per hour during storage at room temperature.—Agric. Mktg Serv., U.S.D.A., Beltsville, Md.

3566. IRITANI, W. M.
The nitrogen release of vegetable crop residues during incubation as related to their chemical composition.
Diss. Abstr., 1959, **19**: 2423-4, being *L.C. Card No. Mic.* 59-527 of 52 pp.

During 4 week's decomposition of vegetable residues under controlled soil conditions, ammonia accumulation was quite high, though variable. The accumulation of mineral N in the soil was primarily affected by the initial N content of the residues. Water-soluble N was twice as important as the insoluble fraction in affecting N release. A multiple correlation using both total and water-soluble N was significantly better than the other correlations tested for predicting N release. The accumulation of mineral N was greater than that produced by the soil alone, when N contents of the residue were above 1·66–1·89%. Carbon played an insignificant role in affecting N release, and the C/N ratio proved to be a relatively poor basis for predicting N release. Release of N was better correlated with CO_2 release than with the C content of the residues. The dry matter accumulation of the test plants (tomatoes) in the experiments was closely associated with N availability.—Univ. Ill.

Artichokes and cardoons.

(*See also* 3722q, 3934.)

3567. MANN, H. H., AND BARNES, T. W.
Jerusalem artichoke.
A.R. Rothamsted exp. Stat. 1958, 1959, pp. 189-90.

The Topine strain of Jerusalem artichoke was planted in late April in rows alternating with the ordinary form with a spacing of 2 × 1·3 ft. When cut at the end of October the weight of tops was twice as high in Topine as in the ordinary form. Data on "root" production and on the effects of autumn cutting will be available later. Topine needs a light, well-drained soil.

3568. POLANO, P.
La coltivazione del carciofo precoce in Sardegna. (**Early globe artichoke production in Sardinia.**)
Stud. sassar. Sez. III, 1959, **5**: 118-34, bibl. 4.

The early artichoke is an important export product of Sardinia, and improved methods of cultivation are still being sought. As regards nutrition P, K and N are all necessary in addition to organic manuring. Present advice, based on experiments, is to apply P and K fertilizers at the time of, or soon after, planting the artichoke ovuli in July and to follow up with N during vegetative growth.

3569. KASMIRE, R. F., GREATHEAD, A. S., AND SNYDER, M. J.
A demonstration of the effects of careful handling and rapid precooling on the market quality of California globe artichokes.
[*Mimeo. Publ.*] *Univ. Calif.*, undated, pp. 4.

Artichokes should be cooled to 32°–42° F. as soon after harvest as possible, and always on the day of harvest. They should be kept cool throughout the transit and marketing period, and all possible sources of rough handling should be eliminated.

3570. MONTSERRAT UBACH TRULLÁS, M.
Estudio comparativo de la acción de los ácidos 2,4-diclorofenoxiacético y 2,4,5-triclorofenoxiacético sobre el crecimiento de las raíces de *Cynara cardunculus* L. (**A comparative study of the action of 2,4-dichlorophenoxyacetic and 2,4,5-trichlorophenoxyacetic acids on the growth of roots of *Cynara cardunculus*.**) [English summary 11 lines.]
Publ. Inst. Biol. apl., 1958, **28**: 105-14, bibl. 28, illus.

Germinating cardoon seeds were placed between folds of filter paper, which had previously been soaked either in distilled water or in solutions of either 2,4-D or 2,4,5-T, and which were adhering to vertical glass plates, held in place by a rack in a covered polythene container. The solutions ranged in concentration from 0·00001 to 100 mg./l. in a logarithmic series. Root growth was stimulated by 2,4,5-T below 0·0005 and by 2,4-D below 0·002 mg./l. At higher concentrations both showed retarding action, which between 0·015 and 20 mg./l. was greater with 2,4-D than with 2,4,5-T.

Asparagus.

(*See also* 3723d, l, r.)

3571. ELLISON, J. H., AND SCHEER, D. F.
Yield related to brush vigor in asparagus.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 339-44, bibl. 7.

Yielding ability of individual male and female asparagus plants is significantly correlated with brush vigour in the preceding year. Positive correlations exist between (a) number of spears and number of stalks, and (b) spear diameter and stalk diameter. Negative correlations exist between (a) number of spears and stalk diameter, and (b) spear diameter and number of stalks. The highest yields of spears are obtained from plants having many large stalks. This information may be useful in asparagus breeding and seed production by eliminating the need for laborious yield records. [From authors' summary.]—Rutgers Univ., New Brunswick, N.J.

3572. HUYSKES, J. A.
A method for selecting asparagus varieties with a long fibreless top. [Dutch summary ¼ p.]
Euphytica, 1959, **8**: 21-8, bibl. 14, illus.

A method, based on breaking the spear, was developed for determining the fibre content. Green spears are required for the test. The length of the fibreless top is related to the total length of the spear.—I.V.T., Wageningen.

3573. BRASHER, E. P.
Establishing fertilizer requirements for asparagus through tissue analysis.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 334-8, bibl. 10.

In studies carried out on asparagus over 3 years all soil applications of N, K and B significantly increased the yield, and the content of these elements in the fern. Applications of N greater than 40 lb./acre had no further effect on the yield or N content of the fern. When K was applied at more than 120 lb./acre no additional yield increase occurred unless B was also applied. When soil applications of N, P and K were held constant, borax increased the yield and B content of the fern. Applications of P increased the P content of the fern in one year only. Spring applications of Cu, Mn and Fe did not enrich the fern in these elements in the autumn. It is concluded that tissue testing can be used as an aid in making more accurate soil applications of N, P, K and B for asparagus, but that more work is needed before it can be established as a reliable method of determining nutritional requirements.—Univ. Delaware, Newark.

3574. JENKINS, J. M., JR.
Asparagus cutting experiment.
Amer. Veg. Gr, 1959, **7**(3): 38.

Total yields over a 4-year period did not show a significant difference between plots cut in the first year after planting and plots cut for the first time at the end of their second year.—Hort. Crops Res. Stat., Castle Hayne, N.C.

3575. KEPNER, R. A.
Development of mechanical harvester for green asparagus.
Pap. annu. Mtg Amer. Soc. agric. Engnrs **58-63**, Santa Barbara, Calif., 1958, from abstr. in *Agric. Engng St. Joseph, Mich.*, 1958, **39**: 653.

Hand-harvesting costs currently represent about 40% of the gross income from the crop. This paper describes a mechanical harvester developed by the University of California which is non-selective, cutting all emerged spears, regardless of length. Harvesting is done at intervals of 5 to 8 days rather than daily. The author reports that, at a speed of 3½ m.p.h., one machine and operator should be able to take care of 125 acres and would replace about 15 hand cutters. Engineering problems and operating features are discussed. [For previous report see *H.A.*, 28: 1395.]

Brassicas.

(*See also* 3487, 3629, 3663, 3722 l, s, v, y, 3723f, h, k, 3855.)

3576. SALOKANGAS, K.
Kaalilajikkeet kokeiltavina. (**Brassica variety trials.**)
Puutarha, 1959, **62**: 120.

Staup 17 was the best of the new Norwegian winter cabbage varieties, all of which were superior to the common Amager strains. Also recommended for Finland were the new Dutch cauliflower Flora Blanca, the brussels sprout variety Weibull's New Rapid, and the broccolis De Cicco and Ferry-Morse's Green Mountain.

3577. NORMAN, R. G.
The importance of variety in brussels sprouts.
Agriculture, Lond., 1959, **66**: 22-5.

The author stresses the importance of using good, not just any old, seed. He then describes the characteristics of 7 types recommended, namely Bretforton, Evesham Growers', Evesham Special, Rous Lench, Cambridge No. 1, Cambridge No. 5 and Bedfordshire.

3578. DANIEL, G. H.
Early cauliflower trials 1954-57.
J. nat. Inst. agric. Bot., 1958, **8**: 423-32, bibl. 3.

The results of 16 variety trials of early summer cauliflower, conducted during 1954-57 at six centres, are presented and discussed. The varieties on trial, in order of their relative earliness, were "Early Snowdrift Improved", "Cambridge No. 7", "Finney's 111", "Pioneer", "Cambridge No. 8", "All the Year Round". Cambridge No. 7, as in the past, showed a tendency towards riceyness and buttoning at most centres. Buttoning was also a feature of Early Snowdrift Improved. The quality of this variety was almost as high as of Cambridge No. 8, which was outstanding at all centres in both quality and yield. Finney's 111 was also of high quality. All the Year Round, though not of outstanding quality, gave a satisfactory yield of marketable produce somewhat later than the rest. [Author's abstract.]

3579. OSARA, K.
Kaalintaimien kasvatuksesta. **(Raising cabbage plants.)**
Puutarha, 1959, **62**: 182-3, illus.

Attempts to obtain early harvests of cabbage and cauliflower were most successful when the seedlings were grown in Jiffy pots, soil blocks or clay pots, although these last involved more labour. Boxes with trellis tops, cardboard pots and frames were less satisfactory, and peat blocks were distinctly too acid.

3580. JUDKIN, F. M.
Prolonged air and light hardening of seedlings. [Russian.]
Sad i Ogorod, 1959, No. 4, pp. 22-5, illus.

Early cabbage and tomato seedlings hardened off for only 3–4 days were killed at −1° C., while those exposed to long hardening off periods withstood −3° C. A new method, by which hot-bed frames were opened on clear sunny days on the southern side to a height of 60 cm. in the morning and 100 cm. at midday in April, and 140 cm. in May, ensured the access of ample air and direct sun-light into the beds. Seedlings exposed to gradual hardening off at an early stage were shorter, heavier, had a higher dry matter content and finally gave higher yields.

3581. BETZEMA, J.
Rond de teelt van zomerbloemkool op kleigrond. **(Growing summer cauliflower on heavy soils.)** [English summary 1½ p.]
Meded. Proefst. Groent. Volle Grond Ned., Alkmaar **12**, 1959, pp. 35, bibl. 8, illus.

The growing of summer cauliflower in the Netherlands is surveyed, and trials on the occurrence of buttoning in summer cauliflowers are described. The percentage of buttoned plants was reduced most by sowing thickly and by transplanting early. Buttoning was most pronounced in soils of poor structure during drought conditions. The greatest difference in earliness was found between the first and second plantings (second half of April and early May respectively); planting in early May resulted in earlier maturity and higher quality than planting in April. In varietal comparisons the earliest Lecerf strains were the most satisfactory; early strains of Alpha are not recommended.

3582. WIDDOWSON, F. V., AND PENNY, A.
Forms of nitrogen for kale.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 46.

One experiment on kale compared seedbed dressings of ammonium sulphate, calcium nitrate and urea supplying 1·0 and 2·0 cwt. N/acre. Seedbed dressings of calcium nitrate and especially of urea reduced plant establishment considerably, but at harvest both these fertilizers had given higher yields than ammonium sulphate. The crop responded well to N fertilizers, and yields were increased five times by the heavy dressings; N applied partly to the seedbed and partly in mid-season gave slightly higher yields than dressings applied wholly to the seedbed.

3583. FRENEY, J. R., DELWICHE, C. C., AND JOHNSON, C. M.
The effect of chloride on the free amino acids of cabbage and cauliflower plants.
Aust. J. biol. Sci., 1959, **12**: 160-6, bibl. 27.

In both cabbage and cauliflower plants, the amino-acid contents of plant tops were generally greater when Cl was deficient. Arginine, proline, methionine sulphoxide, glutamine, asparagine, and pipecolic acid accumulated in large amounts in Cl-deficient plants.—C.S.I.R.O., Armidale, N.S.W., and Univ. Calif., Berkeley.

3584. DAS, B. C.
Comparative effects of 3-indolylbutyric acid, 2,3,5-tri-iodobenzoic acid, and β-naphthoxyacetic acid on flower growth and flower weight of the cauliflower (*Brassica oleracea*).
Canad. J. Bot., 1959, **37**: 471-8, bibl. 3.

Cauliflower plants were treated 19 days after transplanting, 2, 3 or 6 times during a 12-day period, with 0·01–80 p.p.m. of IBA, TIBA (in olive oil) or NOXA. Final flower weights were significantly increased by NOXA, applied twice at 0·2 p.p.m., 3 times at 4 p.p.m. or 6 times at 80 p.p.m. and also by IBA applied 6 times at 80 p.p.m. Plants treated with TIBA commonly developed leaves in the "flower", but this may have been partly an effect of the olive oil solvent.

3585. HUMPHRIES, E. C.
Effect of ascorbic acid on leaf growth.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 77, bibl. 1.

It has been reported that ascorbic acid promotes leaf growth and accelerates flowering of some plants, including Chinese cabbage (*Brassica chinensis*). Experiments repeating precisely the conditions in which ascorbic acid was said to be effective failed to confirm the effect. Ascorbic acid solutions freshly prepared every hour were applied to cotton-wool wrapped round the growing point. Other plants were sprayed with ascorbic acid solution. Both methods of application slightly inhibited the growth of the two youngest leaves unfolding at the time of treatment, but had no effect on subsequent leaves or on time of flowering. [Author's report. See also *H.A.*, 28: 3647.]

3586. PARHAM, P. H., AND MOORE, E. L.
The effect of low temperature exposures on the vegetative and reproductive growth of collards.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 367-73, bibl. 9, illus.

Collard seedlings were exposed to a temperature of 42–45° F. for various lengths of time, and subsequently grown in a greenhouse at temperatures maintained above 60° F. In one experiment, with the Georgia variety, plants receiving no cold treatment or 1 or 2 weeks' exposure to cold grew vegetatively in the greenhouse, producing large leaves on a relatively stocky central axis. Flowering occurred in 50% of the plants exposed for 4 weeks and in all the plants exposed for 6 weeks. Floral induction was accompanied by a great reduction in leaf size and by a corresponding increase in plant height. Plants exposed for 4 weeks flowered later and at a higher node, but produced more flowers, than those exposed for 6 weeks. In a second experiment with the Vates variety it was found that elongation of the central axis, axillary bud growth and flower development were associated with reproductive growth. No morphological change occurred in the apices during the first 4 weeks of cold exposure. Elongation of cells and stem was evident between the fourth and fifth weeks. Five weeks of cold exposure were required for floral induction.—Miss. agric. Res. Stat., State College.

3587. Cetas, R. C.
Row treatment of soils infested with *Plasmodiophora brassicae.*
Abstr. in *Phytopathology*, 1959, **49**: 227.

Sassafras loam and sandy loam soils naturally infested with *Plasmodiophora brassicae* Wor. were given row treatments of VPM (31% sodium methyldithiocarbamate). In greenhouse tests the fumigant was dribbled into open furrows that were closed immediately. Chisel applicators were used in field trials. The VPM was injected 6 in. deep. A water seal was applied immediately. The amount of water applied varied with the moisture content of the soil. Cabbage plants set 14–30 days later were not injured. The treatment of warm (70° F. or above) dry soils with 1 pt. of VPM per 100 ft. of row, followed by the application of 1·5 in. of water by overhead irrigation, resulted in a weed-free band about 16 in. wide, excellent clubroot control, and satisfactory plant growth in the field. In greenhouse tests conducted under similar soil conditions the use of 0·5 pt. of VPM per 100 ft. of row followed by a 0·5 in. water seal resulted in satisfactory control of clubroot and of weeds in an 8-in. band. In contrast, the injection of 1 pt. of VPM per 100 ft. of row into cold (55° F.) loam soils saturated with water resulted in no, or very poor, control of weeds and unsatisfactory control of clubroot, but an increase in plant growth. [See also *H.A.*, 28: 2556.]

3588. Rosser, W. R.
Fungicidal control of club root.
Plant Path., 1959, **8**: 13-15, bibl. 4.

Pentachloronitrobenzene dust at 30 or 60 lb./acre and tetrachloronitrobenzene dust at 8 lb./acre, applied broadcast 13 days before planting and thoroughly incorporated with the soil, gave no control of club root of cabbage on heavily infected land. Half a pint of a 1 in 320 solution of PCNB applied to the dibble holes before planting proved lethal to the cabbages. Replants in the same holes planted 35 days later showed signs of phytotoxicity but were reasonably free from club root infection. The best control, combined with satisfactory yield, was given by mercuric chloride applied at the rate of ½ pint of a 1 in 2,000 solution to each dibble hole at planting.—N.A.A.S., Wolverhampton.

3589. van Hoof, H. A.
Vallers en kanker in bewaarkool. **(Dry rot and canker of cabbage.)** [English summary ⅓ p.]
Meded. Dir. Tuinb., 1959, **22**: 256-63, bibl. 2, illus.

Dry rot of cabbage, caused by *Phoma lingam*, may be reduced by seed disinfection. Soil conditions after transplanting, especially poor soil structure and inadequate drainage, may favour fungus development in infected plants. Results with root dips at transplanting were not encouraging. Cabbages transplanted in early June developed a higher percentage of dry rot than those planted 3 weeks earlier. Canker, also resulting from infection with *Phoma lingam*, occurs during storage, and is also influenced by soil characters. No varietal resistance to *Phoma* infection has yet been found.—Proefst. Groent. Volle Grond. Ned., Alkmaar.

3590. Nielsen, O.
Practical method for controlling cabbage maggots with "E605".
Höfchen-Briefe (English edition), 1958, **11**: 154-8, illus.

E605 was applied to cabbage plants from a tractor-mounted barrel, containing 200 l. of the insecticidal solution, via a distributing boom and 4 hand-operated hoses. This made it possible to treat 60,000 plants in an 8-hr working day.—Lyngby, Denmark.

3591. Harcourt, D. G., and Cass, L. M.
Control of caterpillars on cabbage in the Ottawa Valley of Ontario and Quebec, 1956-1957.
J. econ. Ent., 1959, **52**: 221-3, bibl. 8.

In 1957 85 to 92% control was obtained of the imported cabbageworm, *Pieris rapae*, the diamond-back moth, *Plutella maculipennis*, and a DDT-resistant strain of the cabbage looper, *Trichoplusia ni*, on late cabbage with 4 applications of the following insecticides: 1% endrin dust at 0·25 lb. of toxicant per acre, 2½% Guthion dust at 0·75 lb., and Phosdrin emulsible concentrate at 0·75 lb. The cabbage looper was not controlled with 4 applications of the following: 1% parathion dust at 0·33 lb. per acre, 3% DDT dust at 1·0 lb., 4% malathion dust at 1·0 lb., 5% toxaphene dust at 1·5 lb., and 1% rotenone dust at 0·33 lb. In 1956 the 8 insecticides gave 87 to 97% control of the imported cabbageworm and the diamondback moth, populations of the cabbage looper being almost negligible. [From authors' abstract.]—Crop Insect Sect., Ent. Lab., Ottawa.

3592. GUNTHER, F. A., AND OTHERS.
Magnitudes and natures of nicotine residues on and in field-treated Texas mustard greens.
J. agric. Food Chem., 1959, **7**: 330-5, bibl. 25.

Persistence half-lives averaged 4·5 days with initial deposits of 10–50 p.p.m. Nicotine, cotinine, nornicotine and anabasine were present in aged residues. These results refute the generally held opinion that volatilization of nicotine results in only negligible persistence of residues.

3593. LYONS, J. M., AND RAPPAPORT, L.
Effect of temperature on respiration and quality of brussels sprouts during storage.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 361-6, bibl. 10.
Quality of brussels sprouts.
Calif. Agric., 1959, **13**(6): 11-12.

The respiration and quality deterioration of freshly harvested Brussels sprouts were studied at 5 constant temperatures. Initial respiration rates ranged from 38 mg. CO_2/kg./hour at 32° to 190 mg. CO_2/kg./hour at 68° F. On a scale of 1 to 9, quality ratings declined from 9 (field fresh) to 5 (fair) in 8 days at 68°, and in 72 days at 32° F. At higher temperatures deterioration was characterized by yellowing, discoloration of the stem end, and decay. Deterioration at lower temperatures was associated with a black specking of the entire leaf, loss of fresh appearance (even though green color was retained), and decay. Brussels sprouts were shown to deteriorate rapidly at temperatures above 50°, but to maintain acceptable quality for long periods at temperatures below 50° F. [Authors' summary.]—Univ. Calif., Davis.

Celery.

(*See also* 3722o.)

3594. COYNE, D. P.
Physiological differences in celery varieties in relation to pithiness.
Diss. Abstr., 1959, **19**: 2207-8, being *L.C. Card No. Mic.* 59-118 of 121 pp.

Pithiness in celery petioles followed the death of parenchyma cells. Varieties which became very pithy in cold storage (32° F.) lost a significant amount of fresh and dry weight. The decline in fresh weight of the petioles was largely due to loss of moisture. There was no association between the percentage soluble solids content of the plant and the degree of pithiness. The intrinsic viscosity of the cellulose was significantly lower, and the percentage of cellulose in the fresh tissue was significantly higher, in the pithy outer petioles of Emerson Pascal than in either the non-pithy inner petioles of the same variety or in the non-pithy outer and inner petioles of Utah 15. No significant difference in respiration rate was observed between non-pithy petioles of different varieties. In general, the respiration rate was significantly highest in very pithy petioles. The degree of pithiness was significantly higher in Utah and Summer Pascal grown at temperatures between 60° and 70° F. than at 40°–50° F., 50–60° F. or 70°–80° F. The staining of celery petioles with 2,3,5-triphenyltetrazolium chloride was not useful in differentiating the various stages of pithiness development. One year's data showed that Utah had a significantly smaller cell size than Summer Pascal and Emerson Pascal. This suggests that small cell size may be associated with resistance to pithiness and may be useful as an index in the selection of plants that are resistant to pithiness.—Cornell Univ.

3595. KLINE, J. W.
Growth responses of gibberellin-treated celery plants.
Bot. Gaz., 1958, **120**: 122-4, bibl. 2, illus.

Celery plants aged 9–12 weeks were sprayed 3 times at fortnightly intervals with 40 p.p.m. gibberellic acid (GA), each treatment supplying approximately 0·34 mg. per plant. Older plants (14 and 15 weeks) each received a single application of 0·44 mg. Plants receiving their first treatment at 9, 10 or 11 weeks responded as follows: Compared with untreated controls their petioles were markedly shorter and constricted at the base; the leaves were fewer, with narrower and more serrated leaflets; the stems were heavier and had longer internodes; fresh weight and dry weight of the plants were reduced. The 12-week-old plants sprayed 3 times responded as did the 14- and 15-week plants treated once only. Compared with the controls, they had rather fewer outer leaves, larger leaf blades and longer and heavier petioles. They did not differ significantly from the controls in fresh or dry weight, stem length and weight, or leaf form.

Cucurbits.

(*See also* 3117, 3125, 3481, 3548, 3669, 3685, 3699, 3703, 3722f, j, m, z, 3723s.)

3596. LEVONEN, H. J.
Kurkun istutuksen aikaa. (**Cucumber planting time.**)
Puutarha, 1959, **62**: 110-12.

Recommendations for Finland include the addition of peat to all, and of sand to most, cucumber soils, the incorporation of manure, the maintenance of soil temperature at 20–25° C. either by artificial heat or straw compost, and the use of nitrates as the N source. Cyanamide causes blackening of the leaf margins.

3597. Andeweg, J. M., and de Bruyn, J. W.
Breeding of non-bitter cucumbers. [Dutch summary $\frac{1}{4}$ p.]
Euphytica, 1959, **8**: 13-20, bibl. 13, illus.

One plant was selected from the variety Improved Long Green as having fruits which were not bitter. Bitterness in cucurbits is controlled by a dominant gene, and few strains without bitterness were found in the varieties tested. Bitterness in cucumber seedlings may be determined by trained tasters and also by a chemical method which is described. —I.V.T., Wageningen.

3598. Milthorpe, F. L., and Newton, P.
The influence of temperature and radiation on the expansion of the leaf surface.
A.R. Nott. Univ. Sch. Agric. 1958, 1959, pp. 34-6.

The time to emergence of cucumber seedlings and from emergence to the unfolding of the first foliage leaf decreased rapidly with increasing temperatures (up to 30° C.). In the second phase of leaf surface development the rates of production of new leaves by the terminal meristem, and their unfolding to form independent assimilatory units, were increased by increasing temperatures and radiation up to 30° C. and 120 cal. cm.$^{-2}$ day^{-1}, respectively. However, the rate of expansion of individual leaves and the leaf area finally attached were greatest with radiation of 50–60 cal. cm.$^{-2}$ day^{-1} and a temperature of 25° C., and decreased at higher values. At a nutrient level higher than normal the initial cell number (at unfolding) was not affected by the level of radiation, but the final leaf area varied greatly with node number and level of radiation, and was closely related to cell division after unfolding. The relative rate of root expansion and of stem growth increased throughout the range of radiation used. The predominating influence of radiation on cucumber plants was related to the total amount received per day; it mattered little whether this was given at low intensity over a long period or at high intensity over a short period.

3599. Galun, E.
The role of auxins in the sex expression of the cucumber.
Physiol. Plant., 1959, **12**: 48-61, bibl. 23.

Monoecious and female lines of the variety Yorkstate Pickling were used for studies, in which it was found that the removal of young leaves inhibited elongation more in monoecious than in gynoecious plants. The removal of young leaves also promoted the male tendency and caused strong branching, while the removal of mature leaves had the opposite effect. Measurements of growth substances and inhibitors in extracts showed that the inhibition zone in chromatograms of mature leaves was more prominent for monoecious than for gynoecious plants.—Weizmann Inst. Sci., Rehovot, Israel.

3600. Samish, Z., and Dimant, D.
Bacterial population in fresh, healthy cucumbers.
Food Manuf., 1959, **34**: 17-20, bibl. 18, illus.

An unidentified bacterial flora was observed in the tissues of healthy, fresh cucumbers and in the juice extracted from them. The population was smallest at the stem end. Some characteristics of 3 predominant bacterial types are described, and the effect of the organisms on the development of cavities inside the fruit during fermentation is discussed.—Agric. Res. Stat. and Hebrew Univ., Rehovot.

3601. Harrington, J. F.
Effect of fruit maturity and harvesting methods on germination of muskmelon seed.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 422-30, bibl. 5.

Records have shown that muskmelon seed from the same stock seed germinated better when produced in Colorado than when produced in California. Fertilizer deficiencies had no effect on seed germination. Seed that was fermented germinated better than seed that had been mechanically cleaned. The different steps in mechanical harvesting and artificial drying at 90° F. did not significantly affect germination. Stage of maturity of the fruit had an extreme effect on germination of the seed, even after the light and small seed were removed by milling. This maturity effect was most probably not a post-harvest dormancy effect, for it persisted for 9 months. To ensure fully mature seed in a muskmelon fruit, and therefore high germination, the fruit should be harvested only when it shows good netting and the stem breaks away from the fruit for more than half of its circumference (i.e. at the half-slip stage or more mature). [From author's summary.]—Univ. Calif., Davis.

3602. Fujishita, N.
Studies on the sex expression of flowers in *Cucumis melo* L. (I). Inheritance of andromonoecious or monoecious characters, and a comparison of pollen functioning between hermaphrodite and staminate flowers. [Japanese, with English summary.]
J. hort. Ass. Japan, 1959, **28**: 39-44, bibl. 13, illus.

It was confirmed that monoeciousness in melons differed from andromonoeciousness by a single dominant allele. The germination on an artificial medium of pollen from a hermaphrodite flower reached 75·8%, and from a staminate flower reached 66·2%, after 1 hour of culture. No significant differences in pollen tube elongation were observed. Pollination by pollen from the same flower or from a neighbouring staminate flower had no effect on yield or market value of mature fruits. There were no differences in the rate of fruit set, numbers of viable seeds, or weight of fruits or seeds between fruits pollinated by hermaphrodite or by staminate flowers.

3603. Bradley, G. A., and Fleming, J. W.
The effect of nitrogen, phosphorus and potassium applications on the quality of watermelons.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 431-5, bibl. 6.

The effects of fertilizer combinations of N, P and K on the percentage of soluble solids, rind thickness, rind toughness, hollow heart and white heart of watermelons were studied over a period of 3 years. The only quality factor significantly affected by fertilizers was percentage soluble solids. This was highest when the highest rate of N was combined with P, and when P and K were used together.—Univ. Ark., Fayetteville.

3604. Nikulina, N. K., and Švorneva, A. M.
Toxic bacteriosis of watermelons. [Russian.]
Zašč. Rast. ot Vredit. i Boleznej, 1957, No. 5, p. 55, from *Ref. Ž.* (*Biol.*), 1958, No. 8, Abstr. 34,962.
Švorneva, A. M.
Toxic bacteriosis of watermelon. [Russian.]
S. H. Povolz'ja, 1957, No. 8, pp. 88-9, from *Ref. Ž.* (*Biol.*), 1958, No. 8, Abstr. 34,963.

In the first paper a description is given of this disease, caused by a *Proteus* sp., the characteristic symptoms of which are sharply defined wart-like brown patches; the fruit flesh inside decays. It occurs only on mature or maturing fruit in warm, rainy weather. In the second article warning is given against using diseased watermelons as fodder; they should be burned with lime and buried. For control seed treatment with NIUIF 1 (1 : 300) for 10 min. or with Zbraski's bactericide (1 : 10,000) for 30 min. is recommended.

3605. Rosberg, D. W.
The effect of infrared irradiation on the incidence of tobacco ringspot virus disease symptoms in watermelon.
Abstr. in *Phytopathology*, 1959, **49**: 319.

Infrared irradiation of watermelon seed harvested from "pimpled" watermelon fruits infected with the tobacco ringspot virus greatly reduced the incidence of pimples symptoms in field-grown watermelons. The incidence of pimpled fruits is normally 25–33% when seeds from an infeced fruit are planted. The seeds were irradiated at temperatures of 70, 75, 80, 85 and 90° C. for 5–30 minutes, totalling 18 different treatments. The incidence of pimples disease symptoms in irradiated seed plots was less than 2·0%, compared to 37·8% in the control plots. Infrared irradiation of watermelon seed markedly retarded germination and growth of the young seedlings, delaying fruit maturation about 10–14 days. It is not as yet clear whether infrared irradiation inactivates the tobacco ringspot virus in the seed or masks the symptoms.

Legumes.

(*See also* 3121, 3128-3131, 3136, 3147, 3491, 3722a, b, g, i, j, n, w, 3723g, u, 3917, 4093.)

3606. FAO.
Tabulated information on tropical and subtropical grain legumes.
F.A.O., Rome, 1959, 7½ × 10½ in., pp. 367.

Notes are provided on morphology, habit, culture, yields, diseases, pests, etc., of numerous legumes from many countries. Crops dealt with include various species and varieties of *Phaseolus*, *Pisum* and *Vicia*.

3607. Wallace, D. H.
The relationship of yielding ability to dry matter accumulation and its distribution for several varieties of dry bean, *Phaseolus vulgaris* L.
Diss. Abstr., 1959, **19**: 2437, being *L.C. Card No. Mic.* 59-698 of 133 pp.

Factors which might be related to differential yielding ability were studied using 7 varieties, which were classified as representing 4 types of bean. Significant varietal differences in leaf area were found both within and between types, but differences in net assimilation rate were only significant between types. Within each type, the variety with the higher leaf area most frequently produced the higher yields. The varieties differed in the ratio of leaf area to total dry weight. Results from partial defoliation tests suggested that leaf area, when present in excess, may be a drain on, rather than contribute to, the dry matter supply. Varieties differed in the percentage of dry weight at maturity in their fruit, seed and pod-wall. Changes in dry weights of the embryo axis during germination were noted, and it was shown that a variety with a lower initial embryo axis weight had a relatively lower growth rate during germination, with a resultant smaller seedling size. These factors did not contribute to yield differences. Seed size significantly influenced seedling dry weight, but had no effect on yield. There was evidence indicating that the higher yields produced by one variety (No. 7–16) may have been due to a greater translocation of dry matter from the leaves just before abscission at maturity. Inverse relationships between net assimilation rate and leaf area suggest that little is to be gained from using either as a selection index in breeding for higher yields, and selection on annual yields is to be preferred. It is concluded that yield gains might be achieved through breeding for higher proportions of total dry matter as fruit and for higher proportions of the fruit as seed.—Cornell Univ., N.Y.

3608. CAMPBELL, J. A.
Longval is new bean for fresh market and gardens.
Miss. Fm Res., 1959, **22**(1): 1, 4.

A description is given of this new snap bean variety. Tables record its characteristics, yields, storage capabilities and consumer acceptance in comparison with the commercial varieties Stringless, Black Valentine and Contender.

3609. AZZI, G.
Il rendimento nelle più svariate condizioni di ambiente. **(The yield [of beans] under the most varied environmental conditions.)**
Ann. Fac. Agrar. Perugia, 1958, **13**: 88-95, 96-100, 101-4, 105-9, 110-15, 116-20, 121-6.

The first 5 sections of this paper cover the mathematical aspects of factor interaction and yield variations in general. In Perugia the factor most unfavourable to good yields of beans is drought, the decreasing order of adversity for other factors being poor soil, superficial (as opposed to deep) cultivation, a preceding crop with high nutrient uptake, and insufficient manuring. Beans yields are compared on 4 soils differing in nutrient status, texture and structure, under conditions of deficient, normal and excessive moisture supply. The unfavourable conditions had the greatest effect where soil structure was poor. Clay and river sand were both satisfactory at normal moisture levels, but very poor yields were obtained from the former with excess of moisture and from the latter following drought, the percentage reductions being more marked than on infertile gravelly soil. On a humus-rich sandy loam, drought reduced the yield considerably, but excess of water only slightly.

3610. LANGE, A. H., EHRLER, W. L., AND HAMNER, K. C.
Effect of environment on the uptake-transport of calcium and phosphorus by bean plants.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 349-54, bibl. 15.

Bean plants were grown under controlled conditions for a standard length of time, given radio tracers, harvested, and the tops were analyzed with a Geiger counter. By screening out the low energy beta emission from Ca^{45} it was possible to study the uptake of both Ca^{45} and P^{32} simultaneously. Lack of aeration of the roots of bean plants in nutrient solution for 12 hours caused as much as a 49% decrease in Ca uptake by bean tops, but caused an increase in P uptake up to nearly 5 times the control value. Ca uptake by the tops of bean plants was greatest at pH 5·5 and 7·0, while P uptake was greatest at pH 7·0, when measured over a range of 4·0 to 8·5. A lowering of root temperature from 23° C. to 17° C. tended to increase the Ca content in tops, but seemed to have no effect on P. When the light intensity was decreased from 1,100 f.c. to 450 f.c., bean tops accumulated approximately one-third as much Ca and one-half as much P. An apparent interaction between root temperature and light intensity was shown to affect the uptake of Ca, but not that of P. [Authors' summary and conclusions. For effect of nutrient balance see *H.A.*, 29: 2476.]—Hawaii agric. Exp. Stat.; U.S. Salinity Lab., and Univ. Calif., Los Angeles.

3611. DALLYN, S. L., AND SAWYER, R. L.
The nutritional requirements of Fordhook lima beans.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 355-60, bibl. 26.

The present series of experiments was conducted on long-term, permanent fertility plots. The use of manure was of doubtful economic value where an adequate fertility program was followed on soil in good physical condition. Fordhook lima beans responded to 200 lb./acre of P_2O_5 applied to Sassafras loam with a P reading averaging 30 lb./acre. In one year out of two this response occurred only in the presence of high K—an application of 100 lb./acre of K_2O on a soil reading of 360 for K. No benefit was obtained from 100 lb. N as opposed to a 50 lb. application. The variety Fordhook 242 responded favorably to high N, particularly in the presence of high P. No effect of K was observed on this variety. The difference in variety response to N may have been due to differences in rate of fruit development. [Authors' summary.]—Cornell Univ., Long Island Veg. Res. Fm, Riverhead, N.Y.

3612. INOUE, Y., AND SUZUKI, Y.
Studies on the reproductive physiology of the common bean (*Phaseolus vulgaris* L.). VII. The effects of temperature on the functioning of pollen and pistil. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1959, **28**: 19-22, bibl. 10, illus.

The pistil of Masterpiece bean flowers became receptive from 3 days before anthesis, and the percentage fruit set increased until the day before anthesis. Fruit set was low 1 hour after pollination, but increased with time, and was poor at high temperatures. The best pod set was obtained with plants kept at 15–25° C. for 4 hours after pollination. The percentage set of beans which were kept at 25° C. for 2½ hours after pollination and subsequently at 35° C. for 2½ hours was poorer than that of beans which started at 35° C. and were moved to 25° C. Plants which were kept at temperatures between 10° and 45° C. for 4 hours before pollination set pods well, but above and below these limits no pods were set. [For part VI, see *H.A.*, 27: 1478.]

3613. Wheeler, A. W.
Growth substances extracted from primary leaves and cotyledons of dwarf bean.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 78.

The acidic portion of ethyl-acetate extracts of primary leaves from bean seedlings grown in a mixture of fluorescent (950 f.c.), red and infra-red light, contained a substance with the properties of gibberellic acid. This was most abundant during fastest growth, and less in evidence in seedlings grown in darkness. Bean cotyledons yielded the same growth substance.

3614. Todd, G. W., and Garber, M. J.
Some effects of air pollutants on the growth and productivity of plants.
Bot. Gaz., 1958, **120**: 75-80, bibl. 15.

Pea plants (var. Alaska) and bean plants (vars Red Kidney and Bountiful) were exposed to artificial smog by fumigation with ozonated petrol or ozonated hexene. There were no visible symptoms of injury, but in beans the growth rate of stems, primary and trifoliate leaves was less than half that of untreated controls, although the number of leaves initiated was not significantly affected. The stems increased in water content. The growth of peas was temporarily retarded, even by only a ½-hour exposure to ozonated hexene, but was unaffected by ozone alone, or by repeated fumigations with 1-hexene. [See also *H.A.*, 29: 1014.]

3615. Adlerz, W. C.
Factors affecting transmission of bean yellow mosaic virus.
J. econ. Ent., 1959, **52**: 260-2, bibl. 19.

Tests were made to determine the effect of different species of plants as sources of virus and as healthy indicator plants on the transmission of bean yellow mosaic virus by the aphids *Myzus persicae* and *Macrosiphum pisi*. Broad bean was consistently a better virus source plant than alsike clover, pea or dwarf bean. There was no difference in the susceptibility of these four species. Differences in susceptibility to virus inoculation were, however, found in experiments with 5 french bean varieties. Relative susceptibility varied with the aphid species used and with environmental conditions.—Ore. St. Coll., Corvallis.

3616. Young, W. R., and Ortega C., A.
Combate de plagas del frijol en Cotaxtla. **(Control of bean pests in Cotaxtla.)**
Agric. téc. México, 1958, No. 6, pp. 12, 45, illus.

In the Coxtaxtla district of Mexico bean yields progressively decreased as the sowing date was postponed from late August to late October. In the first crop, control of leaf hoppers (*Empoasca* sp.) and bean beetles (*Diabrotica* sp.) was achieved most economically by 3 applications, at 10-day intervals, of 1 kg. of DDT in 400, 800 and 1,200 l. of water respectively per ha.; 2 applications proved worthwhile, a single one practically useless, and 4 or 5 no more effective than the first 3. In the later crops, heavily infested by various pests, 2 or 3 treatments increased yields, but were uneconomic.

3617. Candia Z., D., Guevara C., J., and Young, W. R.
Toxicidad del DDT para el frijol. **(Toxicity of DDT to beans.)**
Agric. téc. México, 1958-59, No. 7, pp. 4, 41-2, bibl. 4, illus.

Bean leaf hoppers (*Empoasca kraemeri*) and beetles (*Diabrotica balteata*) were satisfactorily controlled on beans without crop injury by wettable methoxychlor at 0·075%, but DDT emulsions at 0·15% and 0·3% were distinctly phytotoxic. The injury was increased by a second application 10 days after the first, checking growth and delaying flowering, and was most severe when spraying was carried out in the hottest part of the day. The wettable powder form of DDT was less toxic at the same concentrations.

3618. Way, M. J., and Doherty, T.
Bean aphid (*Aphis fabae* Scop.) control.
A.R. Rothamsted exp. Stat. 1958, 1959, pp. 127-8.

Broad beans were sown in mid-March at 6 densities ranging from 5·3 to 106 plants per yard of row, in rows 22 in. apart. Aphid infestation was low at the 2 greatest densities (57 and 106 plants per yd), and on these plots the yield was not increased by spraying with demeton methyl at 6 fl. oz. of active ingredient per acre. Initial infestation and subsequent build-up were highest where there was a thin plant stand, and here spraying significantly increased yields. Observation on predators are also recorded.

3619. Lall, B. S.
On the biology and control of the bean fly, *Agromyza phaseoli* Coq. Diptera: Agromyzidae.
Sci. and Cult., 1959, **24**: 531-2, bibl. 10.

The best results were obtained with 0·04% endrin sprays applied at fortnightly intervals during the first 2 months of the growing period. DDT, aldrin and dieldrin were less effective. A pea variety, BR 178, showed considerable resistance to fly damage.

3620. Stone, M. W., and Foley, F. B.
Effect of time of application of DDT on lygus bug populations and yield of lima beans.
J. econ. Ent., 1959, **52**: 244-7, bibl. 4.

In experiments conducted in southern California during 1952–57 a single early or blossom application, a single intermediate application in late July and a combined early-plus-late application gave significant increases in yields of beans, each treatment being superior to a single late application made in August. All treatments reduced pitting, the early-plus-late being responsible for the greatest reduction, though the second (late) application was not economically justified. Peak populations of lygus bugs, *Lygus hesperus*, during the first half of August indicated the need to apply the insecticide 2 weeks after flowering [see also *H.A.*, 29: 467], or in the second half of July, and this intermediate application also reduced damage by the corn earworm, *Heliothis zea*, to pods.—Agric. Res. Serv., U.S.D.A.

3621. Middlekauff, W. W., and Lindt, J. H., Jr.
Pests of field beans.
Calif. Agric., 1959, **13**(6): 7, 14, illus.

Pest damage to pink and red beans has been estimated by random sweeps with insect nets in the field. Without field sampling, DDT or toxaphene dust applied from 40 to 55 days after planting, according to variety, will satisfactorily control corn earworm (*Heliothis zea*) and lygus bugs.

3622. Ramírez Genel, M., Casas, E., and Rubio del Cueto, A.
Susceptibilidad de algunas variedades de frijol al picudo del ejote en la mesa central. **(Susceptibility of some bean varieties to the string-bean weevil on the central plateau [of Mexico].)**
Agric. téc. México, 1958-59, No. 7, pp. 6, 37-8, illus.

Of the 14 bean varieties tested, the 3 most resistant to *Apion godmani* were Negro 151, Bayo 164, and Pinto 168. The susceptible varieties Bayomex and Canocel are recommended for cultivation, provided they are treated for weevil control, because of their high yielding capacity and disease resistance. Recommendations for control are: dusting with 3–5% DDT or 4% malathion at 20–30 kg./ha., or spraying with a 0·15% solution of either insecticide, using 400–600 l./ha., generally 3 times, at intervals of 10 days during flowering, but ceasing when the pods form to avoid toxic residues persisting until harvest.

3623. Lowig, E.
Beobachtungen zum Verhalten des Speisebohnenkäfers (*Acanthoscelides obsoletus* L.) gegenüber der Verpackung. (**Observations on the behaviour of *Acanthoscelides obsoletus* in relation to the package used for storing beans.)**
Saatgut-Wirtsch., 1959, **11**: 103-5.

Fine-meshed sacking, various papers, cardboard and plastic films protected beans from reinfestation by *A. obsoletus* from outside the bag. However, jute fibre bags, which are often used for bean storage, proved unsuitable.

3624. Davies, J. C.
A note on the control of bean pests in Uganda.
E. Afr. agric. J., 1959, **24**: 174-8, bibl. 5.

Bruchid pests (*Acanthoscelides obtectus* and *Callosobruchus* spp.) of stored beans are described and figures for storage losses given. Good control may be obtained by mixing 8 oz. of 0·04% gamma BHC dust with each 200 lb. of beans.—Agric. Dep., Uganda.

3625. MacGillivray, J. H., Clemente, L. J., and Zahara, M.
Preliminary test of harvesting snap beans with a mechanical picker.
Veg. Crop Ser. Univ. Calif. **93**, 1958, pp. 8.

The trials were carried out in July 1958 on crops of the variety Tendergreen in 3 locations in California. The machine, which is manufactured by the Chrisholm-Ryder Co., Niagara Falls, N.Y., is tractor-mounted and harvests two rows at a time at rates of up to 1 acre per hour. The machine left an average of 14·6% of the beans on the plants, and 10·6% were blown out with the trash, giving a recovery of a little under 75% of the crop, all of which, however, was acceptable to the freezing plant. A saving of $1.30–1.80 per 100 lb. was shown by comparison with hand picking.

3626. Palmer-Jones, T.
Effect on honey bees of thiodan applied to broad beans in a cage.
N.Z. J. agric. Res., 1959, **2**: 229-33, bibl. 5.

In a cage test thiodan was sprayed on broad beans at the rate of 56 gal. of a 1% solution per acre. The application was made an hour before bees could visit the beans, the flowers of which were of maximum attractiveness to bees. The spray repelled bees for three hours and no bee mortality occurred, although bees collected nectar extensively from the bean flowers when repellency ceased. The experiment shows that thiodan can be used on broad beans in flower without causing bee mortality provided it is applied at a time when bees are not flying. [From author's summary.]—Anim. Res. Stat., Dep. Agric., Wallaceville.

3627. Sneddon, J. L., and Squibbs, F. L.
Classification of garden pea varieties.
J. nat. Inst. agric. Bot., 1958, **8**: 378-422, bibl. 7, illus.

Two hundred and eighty-four differently named stocks of garden peas obtained from 48 British seed houses were grown in 12 ft. rows for at least three years starting in 1953. Characters suitable for identification and classification are discussed. Varieties are classified into 32 main groups based on characters of the seed and pod, and the height of the stem. Full descriptions are given for 68 varieties and points of difference are given for a further 83 associated varieties. In the discussion on maturity grouping, it is shown that number of nodes to first flower is more constant from year to year than days between sowing and flowering, and some evidence is presented on the relationship between the number of days between sowing and flowering and the number of accumulated heat units during the period. [Authors' abstract.]

3628. GARATUZA, M., AND CASSERES, E. H.
Experimentos con el chícharo en el Valle de Yaqui. (**Experiments with peas in the Yaqui Valley area.**)
Agric. téc. México, 1958-59, No. 7, pp. 7, 34, illus.

In this region of Mexico yields of both pods and seeds were much lower in the pea variety Thomas Laxton than in Rondo or Loyalty. For all 3 varieties, variation in the seed rate from 60 to 120 kg./ha. made no significant difference to yields. When Shasta peas were sown at 80 kg./ha. in various systems of flat and ridged beds with different row spacings, seed yield per ha. was lowest with single rows 92 cm. apart. It was highest with ridges 92 cm. apart that had double rows in the centre, and almost as high with flat single rows 17·5 cm. apart or with flat double rows 92 cm. apart, but the closest spacing made weed control practically impossible.

3629. LAUGHLIN, J. C.
Placement of fertilizers for horticultural crops with special reference to green peas.
Tasm. J. Agric., 1959, **30**: 44-6, bibl. 6.

Preliminary trials on the effects of side placement of fertilizers for peas and summer cabbages gave encouraging results. With swedes no yield response was obtained. Present work on French beans and additional work on cabbages and swedes is not far advanced enough for comment.

3630. PHILLIPS, I. D. J., VLITOS, A. J., AND CUTLER, H.
The influence of gibberellic acid upon the endogenous growth substances of the Alaska pea.
Contr. Boyce Thompson Inst., 1959, **20**: 111-20, bibl. 6.

Pea plants grown in red light had a total growth-substance content lower than those kept in darkness during the first few days of growth, about the same after 8–11 days, and distinctly higher after 21 days. Growth substances of Rf 0·8–0·9 were markedly present only in 7-day-old seedlings grown in darkness and in 11-day-old seedlings grown in red light. Those grown in red light and sprayed on the 5th day with 10 p.p.m. gibberellic acid (GA) increased their content of extractable growth substances by 180% in 24 hours, the corresponding increase in dark-grown seedlings being approximately 100%. A further difference from the untreated controls was the appearance in treated seedlings of growth substances with Rf values of 0–0·3 and 0·6–0·9, which counteracted the growth-retarding influence of red light when extracts containing them were applied to pea seedlings. The results are interpreted to mean that GA may induce the formation of "gibberellin-like" substances as well as auxins.

3631. JACKS, H.
Seed disinfection. XV. Glasshouse tests for control of damping-off of pea seed.
N.Z. J. agric. Res., 1959, **2**: 306-11, bibl. 2.

The effect was investigated of eleven seed dressings on the prevention of damping-off of pea seeds grown in soil inoculated with *Pythium ultimum* Trow. Eleven varieties of pea seeds were used in these tests, and overall the most successful treatments proved to be those based on dichlone and captan. These treatments also gave a significant reduction in the percentages of post-emergence infection of seedlings. Successful treatments accelerated the speed of emergence of seedlings. [Author's summary.]—Massey agric. Coll., Palmerston North.

3632. BUXTON, E. W., AND PERRY, D. A.
***Fusarium* diseases of peas.**
A.R. Rothamsted exp. Stat. 1958, 1959, pp. 110-11.

Of 90 pea varieties sown in two localities, 50% were highly susceptible to wilt (*Fusarium oxysporum* f. *pisi*), including the majority of those most commonly grown in England. Some varieties which had been resistant in Holland and New Zealand proved susceptible in these tests. Including evidence from previous observations, it is now known that 66 of the 143 varieties grown in Britain are susceptible. The growth of the pathogen in culture was strongly inhibited by each of 16 micro-organisms from pea rhizospheres, 3 of which showed increased efficiency in the presence of root exudate. An interaction between *F. oxysporum* and *F. solani*, when both were present in pea plants, occurred during growth in the cortex, where progress of the former toward the vascular tissue was delayed.

Mushrooms.

(*See also* 3723p.)

3633. RASMUSSEN, C. R.
Mushroom strains.
M.G.A. Bull., 1959, No. 111, pp. 66-78.

The author discusses results from an extensive trial of "fast" and "slow" mushroom strains at the Danish Mushroom Research Station and 4 individual mushroom farms. He covers quality, variations in cropping yield, the effects of peak-heating on yield, resistance to disease, and problems of degeneration.

634. Kneebone, L. R.
Control of mushroom diseases by sanitation and cultural practices.
M.G.A. Bull., 1959, No. 112, pp. 109-12.

he leader of mushroom research at Pennsylvania tate University deals briefly with the classification f mushroom diseases and the principles governing heir control, including protection and eradication. urther, he outlines the steps that should be taken rom start to finish to minimize disease incidence.

635. Weigel, C. A., and others.
Tests on lindane and aldrin vapors in the control of adult mushroom flies.
J. econ. Ent., 1959, **52**: 257-8, bibl. 3.

xperiments were conducted in Pennsylvania and Iaryland on the control of mushroom flies, hiefly the sciarid fly, *Bradysia fenestralis* (Zett.), nd the phorid fly, *Megaselia agarici* Lintner, with ndane and aldrin vapors blown into mushroom ouses with electric fans. Vapors were formed y passing the air streams through Fiberglas air onditioning filters previously treated with the nsecticides. The treatment killed adult flies vithout leaving excess residues or adversely ffecting the flavor or aroma of the mushrooms. Authors' abstract.]

Onions and garlic.

(*See also* 3677, 3722d, k, l, x, 3723 l.)

636. Köppä, P.
Sipulin viljelystä ja siihen liittyvistä vaikeuksista. (**Onion growing and its problems.**) [English summary 8 lines.]
Puutarha, 1959, **62**: 195-7, illus.

he most suitable onion variety for growing in Finland appears to be *Allium cepa* var. *aggregatum* the "potato" or aggregate onion). Sets should e stored at 20–24° C. during the winter, treated f necessary with hot water (40° C.) before sproutng, to check downy mildew, sprouted for a week n warmth and light on a moist substrate, and then lanted.

637. Rocha, F. F.
Interaction of moisture content and temperature on onion seed viability.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 385-9, bibl. 6.

nion seeds, with various moisture contents anging from 6·5% to 15%, were subjected to emperatures of 30°, 40°, 50° or 60° C. for 30, 60 r 120 minutes. Time of exposure did not affect ercentage germination at any moisture content or emperature used. Heating resulted in a marked eduction in the germination capacity of seeds with moisture content of 11·1–15%, but had no etrimental effect on the percentage germination f seeds with a low moisture content. Seeds erminated more slowly as the moisture content, temperature and time of exposure were increased. Seeds with high moisture contents (13% and 15%) were worthless after 104 days' storage in sealed containers at 25° C.—Inst. agron. do Sul, Pelotas, Rio Grande do Sul, Brazil.

3638. McManus, M. A.
Certain effects on mitosis in the root tip of *Allium cepa* following application of kinetin and gibberellic acid alone and in combination with indoleacetic acid and maleic hydrazide.
Diss. Abstr., 1959, **19**: 2728-9, being *L.C. Card No. Mic.* 59-911 of 114 pp.

No support was obtained for the view that the contribution of cell division to root elongation is regulated by hormones of the indoleacetic acid, gibberellic acid or kinetin types.—St. Louis Univ.

3639. Downes, J. D.
Growth and certain aspects of the chemical composition of the onion as influenced by nutrition.
Diss. Abstr., 1959, **19**: 3077, being *L.C. Card No. Mic.* 59-1326 of 117 pp.

Where N was limiting, its application resulted in significant increases in the growth of leaves and of bulbs. At a high level of N, concentrations of Mn were increased 4 or 5 times in the leaves and were more than doubled in the bulbs as compared with plants receiving low N levels. High levels of S and Mn had no significant influence on plant composition. P at a high level significantly increased bulb growth and accelerated maturity, and also decreased leaf growth, in comparison with low P levels. Applications of P resulted in a 2- to 3-fold increase in bulb concentrations of P, but did not affect the P content of the leaves. K increased both leaf growth and bulb yields and tended to counteract the detrimental effect of excessively high N. The Mg contents of the plants were significantly reduced by K applications, but were not affected by Mg applications. Zn and Cu applications produced less clearly defined responses in growth and composition.—Mich. St. Univ.

3640. McKay, R.
Onion diseases.
[*Publ.*] *agric. Inst., Dublin*, 1959, pp. xii + 30, bibls, illus.

In this monograph, which is illustrated by excellent photographs, the author deals with all the diseases affecting onions and allied species in Eire, and briefly recommends control measures. The diseases comprise: downy mildew (*Peronospora destructor*), black leaf mould (*Stemphylium botryosum* = *Pleospora herbarum*), white rot (*Sclerotium cepivorum*), neck rot (*Botrytis allii* and other spp.), leaf-tip necrosis (*B. cinerea* and *B. squamosa*), soft rot (*Bacterium carotovorum*), yellow dwarf virus, wilt and bulb rot (*Fusarium* spp.) shanking (*Phytophthora* spp.) smudge (*Colletotrichum circinans*), injury due to sudden cold weather or hail, damage by the parasite *Cuscuta trifolii*, bloat (*Ditylenchus dipsaci*), and smut (*Urocystis cepulae*). Disease dissemination by sets is also discussed.

3641. Husain, S. M., and Newhall, A. G.
Control of *Alternaria* leaf blights and storage rots in sweet Spanish onions.
Abstr. on *Phytopathology*, 1959, **49**: 228.

Onions in small replicated plots were sprayed with a power sprayer during 3 seasons. In 1956 best leaf blight control was obtained with Dyrene (50% 2,4-dichloro-6-(o-chloroanalino) triazine) at 5-day intervals (8 applications), followed closely by Oleocuivre (40% Cu_2O) and maneb (70%), nabam (22%), Iron Vancide (70% ferbam + iron salt of 2-mercaptobenzothiazole), captan (50%), and griseofulvin (95% at 200 p.p.m.), in that order. A 10-day interval (4 applications) was not so satisfactory. Yields were generally correlated with leaf blight control, but total storage rots caused by *Alternaria* sp., *Botrytis* sp., *Fusarium* sp. and bacteria were not. In 1957 Dyrene, Oleocuivre and maneb at 2 and 4 lb./100 gal. (200 gal./acre) were compared on a 5-day schedule. The 2× concentration was not better than 1×. Dyrene and maneb controlled blights better than Oleocuivre. Only Dyrene and Oleocuivre reduced *Botrytis* storage rot significantly at the 1% level. In 1958 Dyrene, maneb and Oleocuivre were superior, in that order, to thiram (42% water suspension), ziram (76%) and Cyprex (70% dodecylguanidine acetate) in the control of leaf blights. Dyrene, Oleocuivre and maneb have thus far been more effective against blights (and the first 2 against *Botrytis* rot) than the other 7 fungicides.

3642. Lall, B. S., and Verma, S. K.
Variability of resistance in the onion varieties against the onion thrips, *Thrips tabaci* (Lind.). Thripidae: Thysanoptera.
Sci. and Cult., 1959, **24**: 575-6, bibl. 4.

Of 8 varieties tested, Poona Red was highly susceptible and Spanish White fairly resistant. Resistance is attributed to the loose arrangement and light green colour of the leaves.—Bihar agric. Coll. Sabour (Bhagalpur).

3643. Lewis, G. D.
Biology and control of the onion bloat nematode, *Ditylenchus dipsaci* (Kühn) Filipjev.
Diss. Abstr., 1959, **19**: 2441, being *L.C. Card No. Mic.* 59-975 of 46 pp.

The rate of nematode mortality was high in the portion of the soil which was frozen during the winter. Individuals of this species persisted in the soil for at least 2 years in the absence of a susceptible crop. Excellent nematode control was obtained with DD fumigation of the soil at rates from 50 gal./acre upwards. Onion crops were not injured by rates of 110 gal./acre [see also *H.A.*, 29: 1480]. In pot tests it was shown that the degree of control given by DD was directly related to soil temperature and inversely related to soil moisture. A comparison of DD with Telone (technical dichloropropene) indicated that approximately 3 parts of DD are required to give the same mortality as that obtained from 2 parts of Telone. —Cornell Univ., N.Y.

3644. Itagi, T.
The relation between harvest time and storability in the onions, Ninomiya-maru and Kaizuka-wase. [Japanese, with English summary ⅓ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 50-6, bibl. 7.

Early harvesting improved storage quality, as did treatment with MH 30, which eliminated the differences due to time of harvesting.

3645. Aguilá Sancho, J. F.
El empleo de la hidrazida maleica en la conservación de la variedad de cebolla "Roja de exportación". (**The use of maleic hydrazide for storage of the onion variety Roja de Exportación.**) [English summary 6 lines.]
Publ. Inst. Biol. apl., 1958, **28**: 95-103, illus.

Plants of the late onion variety Roja de Exportación were sprayed 3 weeks before harvest with 3,000 p.p.m. MH, and the bulbs were stored under conditions of poor aeration together with bulbs from untreated plants. After 18 weeks the percentages of sprouting in treated and untreated bulbs respectively were 10 and 60, after 31 weeks they were 15 and 97, and after 43 weeks 65 and 99. The majority of the untreated bulbs had rotted after 32 weeks, and after 43 weeks the unsprouted, treated bulbs had also begun to decompose. The following year the treatment was carried out a few days before harvesting, and after 30 weeks' storage only 1% of the treated bulbs had sprouted as against 85% of those untreated. After 43 weeks all the untreated and 95% of the treated bulbs had sprouted. Treatment had no effect on bulb flavour or colour.

3646. Dallyn, S. L., and Sawyer, R. L.
Effect of gamma and fast electron irradiation on storage qualities of onions.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 390-7, bibl. 11, illus.

Fast electron irradiation was effective in controlling sprouting and rooting of onions only when it was directed on to the base of the bulbs. This would create a serious mechanical problem of handling in a commercial operation. Gamma irradiation of 12,000 rep completely inhibited rooting and external sprouting and greatly reduced the occurence of internal sprouts. This dosage was also ffective on bulk units up to 50 lb., where the ackage was rotated 180° at the half-time of 20 ours. A high correlation existed, with both types f irradiation, between sprout control and the levelopment of dark growth centers. Apparently rradiation injured the meristematic tissue, causing t to die and gradually turn dark. No consistent ffect of irradiation, at the levels required for sprout ontrol, was found on the amount of decay that leveloped in storage. [Authors' summary.]—Cornell Univ., Long Island Veg. Res. Fm, Riverhead, N.Y.

3647. Dallyn, S. L., and Sawyer, R. L.
Effect of sprout inhibiting levels of gamma irradiation on the quality of onions.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 398-406, bibl. 12, illus.

rradiation of onions with dosages of 8,000 and 2,000 rep, gamma, produced no detrimental ffects on flavour. Sprout inhibiting levels of rradiation usually injured or killed the growing oint, and this affected tissue turned dark during torage. The size of the area involved varied onsiderably from bulb to bulb and may have been letermined by the size of the growing point at the ime of irradiation. Attempts to solve or minimize the problem were unsuccessful. Normally he affected area represented a very small fraction of the entire bulb and its appearance might not e objectionable to many types of user. The lehydrating quality of irradiated onions was dversely affected by the discoloured growing oints. No other physical or chemical property neasured in the dehydration tests was affected by rradiation. No effects on sugar content or volatile onstituents were produced by irradiation levels ubstantially above those required for external prout inhibition. [From authors' summary.]—Cornell Univ., Long Island Veg. Res. Fm, Riverhead, N.Y.

3648. Koleff, N., Poppoff, I., and Doganowa, L.
Veränderungen des Gewichts, der chemischen Zusammensetzung und Aktivität einiger Enzymsysteme des Knoblauchs in Abhängigkeit von den Lagerungsbedingungen. **(Changes in the weight, the chemical composition and the activity of certain enzyme systems of garlic in relation to conditions of storage.)** [Russian and English summaries about 10 lines each.]
Arch. Gartenb., 1959, **7**: 52-60, bibl. 5.

Summer garlic was found to possess much better keeping quality than winter garlic, but at 0° C. he keeping quality of winter garlic equalled that of summer garlic. The quicker loss in weight of winter garlic bulbs was due to a higher rate both of evaporation and of respiration associated with nzyme activity.—Bulgarian Acad. Sci., Sofia.

Rhubarb.

3649. Loughton, A.
Manurial experiments with rhubarb for forcing: progress report.
Exp. Hort., 1959, No. 2, pp. 26-33, bibl. 1.

The main response of forcing rhubarb grown on an infertile soil was to nitrogen. In the first experiment, with Victoria, N increased the yield of marketable rhubarb by 0·74 lb. per root; its effect was mainly to increase the weight per stick of rhubarb rather than to increase the number of sticks. The effects on yield of P and K were small and irregular, but there was a tendency for better coloured rhubarb to develop with high K. Increases in N increased the number and weight of sticks and root weights of the variety Prince Albert. The effects of P and K were smaller, although K increased root weight and the yield of second-grade rhubarb. The interaction between N and P was significant with Prince Albert.—Stockbridge House exp. Hort. Stat.

Root crops.

(*See also* 3181, 3186, 3475.)

3650. Tayel, M. A., and Moursi, M. A.
Some factors influencing the growth rate of beets.
Ann. agric. Sci. Cairo, 1957, **2**(2): 29-34, bibl. 3.

Four varieties were sown at Alexandria in September, October and January. The highest yields were obtained from those planted in the coolest weather (October), and Detroit Dark Red was the best variety at this season.

3651. Thorold, C. A.
Market garden experiment.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 187.

At Woburn Experimental Station the highest percentage of bolting in globe beet occurred on plots receiving 20 tons of sewage sludge per acre plus nitrochalk dressings, giving 0·3 cwt. of N per acre. There was no bolting where both organic manure and inorganic N were withheld.

3652. Theiller, G., and Delmas, J.
Traitement de la carence en Mn sur betterave rouge. **(Treatment of Mn deficiency in red beet.)**
Ann. agron., 1958 (issued 1959), **9**: 408-9.

Treatments given to beet plants showing deformed leaves, red pigment and brittle texture as from mid-May were 15 g. $MnSO_4$ applied to the soil per square metre, 5%$MnSO_4$ sprayed, 10%$MnSO_4$ sprayed, and 5% sprayed + 15 g. $MnSO_4$ applied to the soil. All treatments were successful, and it is suggested that soil treatment should be given at the time of sowing. Spraying with a 5 or

10% solution afforded a quick, effective and economic remedy, and it is suggested that 2 applications of a 5% solution, 3 to 4 weeks apart, should do all that is wanted to restore health and yield. On this same soil Mn deficiency symptoms were obvious on chicory, haricot beans and peach trees, and tomato growth, but not appearance, was also depressed. Asparagus, on the other hand, gave excellent yields. [For earlier work see *H.A.*, 28: 2624.]

3653. Žukova, P. S.
Pre-sowing treatment of carrot seeds with stimulants. [Russian.]
Sad i Ogorod, 1959, No. 4, pp. 17-18.

The germination of carrot seeds was greatly improved, and the yields, especially of marketable roots, was increased, by treatment with several growth stimulants. The best results were obtained with heteroauxin (IAA) at 0·4 and 0·6 g. in 1 litre of water, which raised yields by 29·5 and 31·5% respectively.

3654. Kurdina, V. N.
The effect of the dates of sowing on the yield, chemical composition and storage quality of carrots. [Russian.]
Dokl. Mosk. s-h. Akad. im. K.A. Timiryazeva, 1957, No. 28, pp. 380-5, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,130.

With the carrot variety Nantes early sowings resulted in a larger leaf area, higher chlorophyll content, more intensive respiration and higher yields of more nutritious and better flavoured roots of improved storage quality than did later sowings.

3655. Shimokawa, M., and Yokomizo, T.
Studies on the increased use of vinyl film all the year round for vegetable growing. No. 1. Forcing the carrot variety "Sanzun" using vinyl cloches. [Japanese, with English summary ½ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 37-42, bibl. 3.

Vinyl cloche tunnels were compared with the marsh-reed shades normally used for forcing carrots. Early-season temperatures under the cloches averaged 19–20° C., and were much higher than those under the reed shades. The best results were obtained when seeds were sown in January and February. The early removal of the vinyl tunnels delayed maturity and resulted in an increase of root splitting. Vinyl cloche culture tended to emphasize varietal differences in maturation and root splitting.

3656. (Goidànich, G.)
Avversità delle colture orticole. Carota. **(Pest and disease damage in vegetables. Carrots.)**
Progr. agric., 1959, **5**: 704-5, illus.

Chemical measures are not recommended against the carrot moth (*Depressaria marcella*), as they would involve repeated spraying during flowering. Constriction and cork formation at or immediately below the collar can be avoided by good regulation of the water supply. The carrot fly (*Psila rosae*) can be controlled by spraying in May and August with emulsions of contact insecticides at 4 l. per sq. m. Blackening, caused by *Alternaria radicina*, should be treated with either bordeaux mixture or a dithiocarbamate product at the first appearance of symptoms. No satisfactory treatment has yet been evolved against the tortrix moth *Phalonia zephirana*. The white mould caused by *Sclerotinia sclerotiorum* is easily prevented, if growing conditions are good and routine fungicidal treatment is applied.

3657. Savary, A., Mottier, P. P., and Deshusses, L. A.
Essai de lutte contre la mouche de la carotte. **(Trials on carrot fly control.)**
Rev. hort. suisse, 1959, **32**: 184-7.

Diazinon (0·1%) applied to main-crop carrots in mid-August and 2–3 weeks later completely controlled carrot fly (*Psila rosae*). Three sprays of DDT gave 64–81% control.

3658. van 't Sant, L. E.
Control of carrot fly (*Psila rosae* F.) with chlordane in Holland.
Proc. 10th int. Congr. Ent. 1956, 1958, **3**: 321-3, bibl. 3, reprinted as *Meded. Inst. PlZiekt. Onderz.* **189**.

A moderate infestation of carrot fly was controlled by a soil treatment of 2 g. actual chlordane per sq. m. The application of 4 g./sq. m. was necessary to control a heavy infestation. No positive effect of chlordane on carrot flavour was detected.

3659. Lichtenstein, E. P.
Absorption of some chlorinated hydrocarbon insecticides from soils into various crops.
J. agric. Food Chem., 1959, **7**: 430-3, bibl. 17.

Lindane, DDT and aldrin were absorbed into crops, the degree being dependent on the crop, the soil type in which the crop had grown, the insecticide, and its concentration within the soil. Carrots not only absorbed more insecticide than any other crop, but in the case of lindane accumulated greater quantities of the chemical than occurred in the soil. The insecticides were most readily absorbed from a sandy loam and least from a muck soil. The amounts absorbed by the same crop from the same type of soil were not in direct proportion to the concentration of the insecticide recovered from the soil, and relatively less insecticide was absorbed from soils in which the insecticide was most concentrated. Crops grown in aldrin-treated soils contained within their tissues both aldrin and dieldrin. [From author's summary.]

3660. Bessey, P. M.
Studies on the occurrence, measurement, and control of bitterness in carrots.
Diss. Abstr., 1959, **19**: 3076, being *L.C. Card No. Mic.* 59-1320 of 112 pp.

Bitterness in stored carrots was more pronounced in early maturing varieties than in late varieties, and in earlier sowings of a particular variety than in later sowings. Deficiencies of Cu and Mn did not induce bitterness. Bitterness susceptibility was more successfully reduced by the cool growing season of 1956, than by any varietal, field or storage treatment. In carrots stored at 40° F. bitterness was 3 to 5 times as intense as at 32° F. Storage in the presence of apple emanations induced bitterness within 6 weeks, but in controlled atmosphere storage (3% and 7% O_2, and 10% and 5% CO_2) carrots retained their typical flavour without bitterness. The fluorescence of bitter roots under ultra-violet light was used as a rapid method of determining bitterness.—Mich. St. Univ.

3661. Valenta, M., and others.
Stanovení derivátů indolu v rostlinném materiálu II. Askorbigen, vázaná forma vitaminu C, v rostlinách rodu *Raphanus* L. **(Determination of indole derivatives in plant material—II. Ascorbigen, the bound form of vitamin C, in plants of the genus *Raphanus*.)** [Russian, English and German summaries ½ p. each.]
Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1958, **31**: 1579-92, bibl. 33.

In *Raphanus* species forming tuberous roots, the contents of ascorbigen were much greater in the leaves than in the roots. They were highest in the young leaves, but decreased with increasing age. Ascorbigen contents also differed according to strain, a point of importance in selection. Plants of *Raphanus sativus* var. *esculentus* and var. *oleifera* had higher relative contents of vitamin C and of ascorbigen than *R.s.* var. *radicula*. [For part I, see *H.A.*, 26: 3716.]

3662. Matsuura, H.
Studies on the year-round cultivation of vegetables containing pigments other than chlorophyll. I. The influence of growing season and nutrition on the growth and colour of radish. [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 43-9.

While the anthocyanin content of radish was reduced by the application of N fertilizer, the amounts of chlorophyll and carotene were roughly proportional to the quantities of fertilizer applied. The anthocyanin content of the root was greatest in winter and least in summer, the opposite being the case in the leaves.

3663. Joyce, A. E.
Carotenoids of *Brassica napus*.
J. Sci. Food Agric., 1959, **10**: 342-8, bibl. 18.

The following hydrocarbon polyenes have been found by chromatography and spectroscopic examination in the vegetable swede (*Brassica napus*): two fluorescent polyenes, η-carotene, β-carotene, ξ-carotene, γ-carotene, neurosporene, lycopene, seven poly-*cis*-lycopenes and three tri-*cis*-lycopenes. Only one non-hydrocarbon pigment was present in sufficient quantity to permit investigation, and the quantity did not permit the assigning of a definite identity. The type of pigments occurring in swede shows a close similarity to those occurring in berries and fruits. These pigments have so far only been found in sprouted swede. In fresh swede there are substances which interefere with and, in fact, prevent chromatographic analysis. [Author's abstract.]—Minist. Agric. exp. Factory, Aberdeen.

Salad crops.

(*See also* 3125, 3722c, e, p, 3723e.)

3664. Brookfield, S. H.
Well-hearted lettuce at 7 in. square.
Grower, 1959, **52**: 35-7, illus.

A dark green selection from Gotte à Forcer was named Cannington Forcer. It can be grown at 7 in. square in heated houses or in cold houses and frames, cropping from December to early April. It is highly resistant to some strains of *Bremia*, but is susceptible to *Botrytis* and tipburn.—Somerset Fm Inst.

3665. Zink, F. W.
Development of spiraled heads in Great Lakes lettuce.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 377-84, bibl. 4, illus.

Differences were observed between strains of Great Lakes in the production of spiraled head formation. Seasonal differences were found within a given strain in the expression of this type of head formation. Examination of plants with spiraled heads showed that, in many cases, the margins of the wrapper leaf or leaves were united. Two types of united leaf margins were observed: union of the leaf margins of two successively initiated leaves, along one side of the leaf lobe, and union of the opposite margins of a single leaf lobe. It was shown that the united leaf or leaves bind the head, with the resulting mechanical pressure forcing the subsequently initiated leaves into a spiral-like fold. Union of wrapper leaf or leaves appears to be the major cause of spiraled head development in direct-seeded Great Lakes. Cultural practices such as depth of seeding, spacing at thinning, and soil pulled around the plants did not affect spiraled head percentages. [Author's summary.]—Univ. Calif., Davis.

3666. Dullforce, W. M.
Preliminary observations on the growth and development of lettuce, var. Cheshunt 5b.
A.R. Nott. Univ. Sch. Agric. 1958, 1959, pp. 38-42, bibl. 3.

Under conditions of relatively low light and high temperature (21° C.) Cheshunt 5b produced fewer, smaller leaves of thinner texture in a given period of time than in a more balanced environment. With higher light intensity and at 16° C. the leaves had greater length/breadth ratios and longer petioles, and the internodes were longer. It is suggested that either leaf area ratio or the lamina area/weight ratio may be used as an index of hearting ability.

3667. Raleigh, G. J.
Effects of varying day and night temperatures on seedstalk elongation in 456 lettuce.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 374-6, bibl. 4.

Preliminary results indicate that day temperatures may be high without causing undue bolting, provided that night temperatures are comparatively low. For example, flower stalks were significantly longer at 70° F. day and night, or at 70° day and 60° night, than at 80° day and 60° night, or at 80° day and 50° night temperatures, respectively.—Cornell Univ., Ithaca, N.Y.

3668. Poljakoff-Mayber, A., and Mayer, A. M.
Growth and development of lettuce germinated in gibberellic acid.
Bull. Res. Coun. Israel, Sect. D, 1959, **7D**: 54, bibl. 3.

It seems that in lettuce GA only affects the internodes directly treated. Prolonged application is required to cause such an effect, single applications or seed treatment being almost ineffective. The prolonged treatment also results in earlier flower formation. [Authors' conclusion.]

3669. Mackay, D. C., and Eaves, C. A.
Note on the response of several vegetables to "anthraxylate" soil treatments.
Canad. J. Plant Sci., 1959, **39**: 253-4, bibl. 1.

Anthraxylate is a soil amendment prepared from coal by a process of partial oxidation. In field and greenhouse experiments substantial yield increases of lettuce and cucumbers were obtained from the incorporation of anthraxylate in a sand of extremely low fertility and organic matter content.—Exp. Fm, Kentville, N.S.

3670. Das, A. C., and Western, J. H.
The effect of inorganic manures, moisture and inoculum on the incidence of root disease caused by *Rhizoctonia solani* Kuhn in cultivated soil.
Ann. appl. Biol., 1959, **47**: 37-48, bibl. 17.

In glasshouse experiments the growth of *R. solani* was poor in all treatments when unsterilized soil was used. In sterilized soil its growth was increased by balanced fertilizer, by a moderate level of K and by the highest P rate, but was decreased by the highest K level and the higher N rates. Lettuce seedlings responded to moderate amounts of balanced NPK fertilizer, but were checked by higher levels of NPK and of single nutrients, although the incidence of disease was increased by balanced and N fertilizers. Drier soils favoured mycelial growth, for which a minimum supply of nutrient was necessary, but large quantities of inoculum reduced the effect of the pathogen.—Dep. Agric., Leeds Univ.

3671. Anon.
Control of *Botrytis* achieved.
Chem. Ind. Lond., 1959, No. 34, pp. 1065-6, illus.

Grey mould of lettuce may be controlled by a new product, Allisan, a formulation containing 4% of a non-toxic, nitrated chloroaniline-derivative. Control of *Botrytis* stem rot of tomatoes and of tulip fire under glass by the same substance is also promising. Recommended application rates are: for lettuce, ½-1 oz. per sq. yd. of seed bed before raking in the seed; ¼ oz. per sq. yd. dusted on seedlings when the first true leaves are formed and at monthly intervals until planting out; for crops in greenhouses 1 oz. per sq. yd. of bed before planting is the only treatment necessary. For fire of tulips under glass Allisan is applied as a fog at ⅛ oz. per sq. yd. For *Botrytis* stem rot of tomatoes a paste made with water is applied to the affected areas.

3672. Carlson, E. C.
The effect of lygus and hyaline grass bugs on lettuce seed production.
J. econ. Ent., 1959, **52**: 242-4, bibl. 4.

Evidence is presented indicating that not the lygus bug, *Lygus hesperus*, but the hyaline grass bug, *Liorhyssus hyalinus*, is responsible for yield reductions and poor germination in late maturing lettuce seeds. For control DDT or toxophene is used at present.—Univ. Calif., Davis.

3673. Skelton, A.
Harvesting and marketing cabbage lettuce.
Agriculture, Lond., 1959, **66**: 19-22.

In this essentially practical article the author deals in turn with preliminary arrangements for harvesting into crates and boxes, packing either in the field or in packing sheds, the desirability or otherwise of washing, haulage to market and containers.

3674. Macomber, A. Z.
Marketing costs and margins for California lettuce.
Mktg Res. Rep. U.S. Dep. Agric. **225**, 1958, pp. 11.

The transition in the lettuce industry from shed packing and icing to field packing and vacuum cooling has meant more efficient harvesting and shipping with a resultant reduction in marketing costs. Costs between grower and consumer are analysed.

3675. Barry, G., Black, W. R., and Chapogas, P. G.
Evaluation of fiberboard shipping containers for lettuce.
Mktg Res. Rep. U.S. Dep. Agric. **248**, 1959, pp. 38, bibl. 2, illus.

Cartons used for field-packed and vacuum-cooled lettuce showed an increase in bruising as the weight of the pack increased. Bruising also increased from the largest to the smallest container. A weight-space relationship of 1·4–1·5 lb. per 100 cu. in. appeared to be the best arrangement for combining economic use of carton space with protection from serious bruising.

3676. Barger, W. R., and others.
Transit temperatures of California lettuce.
Mktg Res. Rep. U.S. Dep. Agric. **285**, 1958, pp. 16.

Rail shipments were made in ice bunker and refrigerator cars from Salinas, California, to New York, an 8-day journey, in August 1957. Standard refrigeration with 2% of salt initially and with 3% at each re-icing was found satisfactory so long as the lettuce had been well pre-cooled. Chimney loading, i.e. with a vertical air channel in the centre of a car-load of cartons, showed no advantage over on-side loading, i.e. leaving a length-wise channel. Both wirebound crates and cartons proved to be suitable containers. Mechanically refrigerated cars were also successful. No appreciable wilting occurred in either type of car, and, when the average temperature was kept between 34° and 42° F., no marginal browning, decay or russet spotting was observed and the general appearance of the lettuce was acceptable; shelf life, however, was longer if the temperature during transit was held below 40° F. [See also *H.A.*, 29: 1552b.]

3677. Bardner, R., and Way, M. J.
Seed treatment with insecticides.
A.R. Rothamsted exp. Stat. 1958, 1959, pp. 130-1.

White mustard was one of the test seeds in an investigation which showed that, under some conditions, both activated carbon and polyvinyl γ-BHC acetate depressed the insecticidal activity of Thimet, γ-BHC and dieldrin, and decreased the phytotoxic effects of the first two. This year's results confirmed that in sand, seed dressings are more toxic to plants and insects than in soil. Preliminary experiments on control of the onion fly, *Delia antiqua*, showed that dieldrin could prevent damage, presumably by contact with the larva, which always entered the underside of the bulb even when the seed was sown 1 in. deep.

3678. Bondoux, P.
Essai de traitement de la maladie des "racines tordues" du cresson. **(Experimental treatment of crook root disease of watercress.)**
C.R. Acad. Agric. Fr., 1959, **45**: 271-4, bibl. 5.

The disease, caused by *Spongospora subterranea*, is described. Control was achieved by applying zinc sulphate at the rate of 1 kg. per 50 m. of a watercress bed 2·5 m. wide. Applications were made from about 15 October onwards at the time of each cutting.

Tomatoes and other Solanaceae.

(*See also* 3117, 3125, 3133, 3185, 3199, 3201, 3204h, 3487, 3548, 3559, 3580, 3671, 3722h, j, r, u, 3723o, q, v, w, x, 3863, 4139, 4159.)

3679. Peirce, L. C.
Heritability of certain economic characters of the tomato.
Diss. Abstr., 1958, **19**: 1178, being *L.C. Card No. Mic.* 58-7018 of 99 pp.
Peirce, L. C., and Currence, T. M.
The efficiency of selecting for earliness, yield, and fruit size in a tomato cross.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 294-304, bibl. 6.

The heritability of fruit size was high, and one generation of selection resulted in a considerable gain in fruit size. The maturity date showed little response to selection. A consistently favourable genetic relationship existed between earliness and yield. Selection for either character tended to produce an overall improvement in plant performance. Selection for fruit size alone, however, eliminated many good, high-yielding genotypes. —Univ. Minn.

3680. Daubeny, H. A.
Factors contributing to earliness in tomato breeding, with special reference to ability to set fruit at low temperatures.
Diss. Abstr., 1959, **19**: 2423, being *L.C. Card No. Mic.* 59-972 of 84 pp.

Data from field trials, conducted for 3 years at Ithaca, N.Y., revealed that the varieties Puck, Fireball, and Red Cloud, and the Cornell breeding lines 54-149 and 54-179 each showed early flowering, early fruit set, and early ripening of fruit. These and several more varieties set fruit at night temperatures that were lower than those reported in the literature as limiting fruit set in most commercial varieties. The earliness characteristics of Puck were dominant in the F_1 and F_2 progenies of the variety crossed with the later varieties Earliana, John Baer and Rutgers. Varietal differences in pollen germination and stylar elongation were found at low temperatures and both of these factors were considered to have some effect on fruit set. Viable pollen was produced in abundance at low temperatures in the field by all the varieties studied, from which it was concluded that this was not a factor limiting fruit set.—Cornell Univ., N.Y.

3681. KRICKL, M.
Frostsichere Tomaten: eine Aufgabe für die Zukunft. **(Frost resistant tomatoes: a task for the future.)**
Saatgut-Wirtsch., 1959, **11**: 105-8, bibl. 2.

Several years' selection work with a strain of Bonner Baste [Bonny Best] suggests that early tomato varieties resistant to −5° to −6° C. should soon be available.—Höher. Bundeslehr- u. Versuchsanst. f. Gartenb., Schönbrunn-Wien.

3682. KATTAN, A. A., HORTON, B. D., AND MCFERRAN, J.
Effect of variety and date of planting on tomato yield and quality.
Ark. Fm Res., 1959, **8**(1): 5, illus.

Experiments at Fayetteville in 1958 showed Homestead 24 and Big Boy to be the best of the fresh market varieties, and Kokomo and Urbana the most profitable for processing. The highest marketable yields were obtained from early plantings (first week in May).

3683. ÅKESSON, H.
Weibulls Immuna F_1-tomate. **(Weibull's Immuna F_1 tomato.)** [English summary 1¾ p.]
Agri hort. genet., 1959, **17**: 76-95, bibl. 16.

Extensive comparative trials showed that the tomato variety Immuna combined high yields and earliness with good quality and resistance to *Cladosporium*. The variety also gave very good results in unheated glasshouses. Data of tests in different Scandinavian countries are tabulated.

3684. BABUŠKIN, L. N.
The action of variable temperatures on tomato seeds. [Russian.]
Fiziol. Rast., 1959, **6**: 211-13, bibl. 11.

When one batch of tomato seeds was soaked and kept at 20° C. for 2 days, another kept at 0° C. by day and at 20° C. by night for 15 days and a third at 20° C. by day and at 0° C. by night, the third treatment provided plants giving the highest and earliest yields.

3685. BALL, G. C.
How to get earlier, bigger yields.
Amer. Veg. Gr, 1959, **7**(3): 17, 49, illus.

Commercial experience with peat pots showed that earlier and heavier yields of outdoor tomatoes and cucumbers were obtained with peat pots than with conventional transplants. Tomato plants were successfully transplanted even when the first flowers had appeared. Yields of cucumbers started in peat pots were about 20% higher than those of direct-seeded plants. When planting was delayed, adverse after-effects were much less pronounced with peat pots than with conventionally-raised plants.

3686. DE VRIES, K. J.
De mogelijkheid tot vervroeging van de stooktomatenoogst in moderne kassen. **(The possibility of increasing early yields of glasshouse tomatoes in modern glasshouses.)**
Landbouwk. Tijdschr., 1959, **71**: 273-8, bibl. 6, illus.

It is estimated that a modern glasshouse (6 m. wide, roof slope at least 30°, glass panes at least 60 × 100 cm. and continuous ridge ventilation) will allow 10% more light through to the crop than a multiple Dutch-light structure. Therefore harvesting could start at least 4 days earlier in the modern glasshouse. Economically, harvesting should start 2 days earlier to cover the higher fuel costs of the glasshouse.—Inst. TuinbTech., Wageningen.

3687. SAYRE, C. B.
Spacing of cannery tomatoes.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 305-11, bibl. 8.

These experiments indicated that 5,000 to 6,000 plants per acre would give the largest net returns. As the plant population increased, the yields per plant decreased and the costs per acre increased, so that at some plant density a point of diminishing returns is reached. Equidistant spacing of plants gave maximum yields per plant, but from the practical standpoint the distance between rows must be at least 4 ft., and on rich soils with abundant rainfall or irrigation 5 ft. is approximately the minimum planting distance between rows. Therefore, in order to obtain optimum yields per acre, plants must be spaced closer in the row. With the variety Geneva 11, a planting distance of 1·5 ft. within the rows proved very satisfactory in normal-row plantings. Excellent results were also obtained in 4-ft. spaced rows with the plants 2·25 ft. apart in the rows. The twin-row pattern of planting, in which the rows within each pair were 1·5 ft. apart, produced significant increases in yields in a dry season, but in a season of abundant rainfall the luxuriant vine growth resulted in reduced yields at the closest spacings in twin rows. [From author's conclusions.]—N.Y. St. agric. Exp. Stat., Geneva, N.Y.

3688. BÜTTNER, G.
Der Einfluss des Kappens und der Jarowisation auf den Ertrag von Tomaten im Freilandanbau. **(The effect of stopping and vernalization on the yields of tomatoes growing in the open.)**
Gartenbauwiss., 1958, **23**: 401-7, bibl. 16.

With tomatoes the beneficial effect of seed vernalization was short-lived. The tomatoes were grown with one stem and stopped after the second, fourth and sixth truss, the control remaining unpruned. The highest yields were obtained from plants with 4 and 6 trusses, but the fruit on plants with only 2 trusses matured earlier, earliness declining with the number of trusses left. It is suggested that tomatoes with 2 trusses are suitable for intercropping or for cultivation in frames.—Inst. Gartenb. Dresden Pillnitz.

3689. Cooper, A. J.
Observations on the growth of the leaves of glasshouse tomato plants between March and August.
J. hort. Sci., 1959, **34**: 104-10, bibl. 3.

A method of estimating leaf area from leaf length is described. No relationship was found between the rate of appearance or senescence of leaves and either the time of the year or the age of the plant. A relationship was shown to exist between the time of the year at which leaves appeared and both the duration of their growth period and the form of their growth curve. The duration of the growth period decreased from March until late May or early June, and then increased. Leaves appearing during May and early June made a smaller proportion of their total growth in the first half of their growth period than did leaves appearing earlier or later. There was a tendency for the leaf arising immediately above an inflorescence to be smaller than the leaf arising below an inflorescence. The majority of leaves with a long growing period attained a larger size and made more of their total growth in the first half of their growth period than did leaves with a shorter growing period. [Author's summary. See also *H.A.*, 28: 1506.]—Glassh. Crops Res. Inst., Littlehampton.

3690. Cooper, A. J.
Observations on the growth of the fruit on glasshouse tomato plants between March and September.
J. hort. Sci., 1959, **34**: 96-103, bibl. 7.

A non-damaging method of estimating the volume of a tomato fruit while still attached to the plant is described, and its accuracy assessed. Evidence is presented suggesting that there is a relationship between the rate of appearance of fruits in the Potentate variety and both the time of the year and the age of the plant. A relationship is demonstrated between the length of the maturation period of a fruit and the age of the plant. Possible effects of plant age and truss position on the forms of the growth curves of fruits are discussed. Fruits that begin to swell rapidly on appearance have a shorter maturation period than those that have a period of initial lag before rapid growth begins. The more distal the position of a fruit within a truss the longer is its maturation period. [From author's summary. For a paper on general growth trends of tomatoes, see *H.A.*, 28: 1506.]—Glassh. Crops Res. Inst., Littlehampton.

3691. Dikij, S. P.
The effect of organo-mineral mixtures on tomato yields. [Russian.]
Sad i Ogorod, 1959, No. 3, pp. 22-4.

The yield of ripe tomatoes was increased by 23·7% over that of unfertilized controls by applying an organo-mineral mixture to the planting holes at the rate of 22 centners of humus plus mineral N at 20, P [P_2O_5?] at 30 and K [K_2O?] at 20 kg. per ha. This represented an increase of 9·1% over the yield from mineral fertilizing alone. By increasing the humus constituent to 30 centners per ha. the yield was raised to 34·9% above the control and to 18·9% above that from inorganic fertilizers applied alone. Increases in the dry matter content of the fruit were 0·65% from mineral, and 0·82% from organo-mineral, fertilizing.

3692. Bradley, G. A., and McFerran, J.
Tomato fertiliser and liming tests on Coastal Plain soils.
Bull. Ark. agric. Exp. Stat. **596**, 1958, pp. 26, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-312.

Liming a soil of pH 5·1 increased yields and reduced blossom-end rot over two years. Liming a soil of pH 6·2 had no effect on yields. The optimum rates of N were 25–50 lb. applied under the row and 30–60 lb. per acre applied as a side-dressing. Plants responded to P and K application when the soil contained less than 100 lb. of available P_2O_5 or K_2O per acre.

3693. Malcolm, J. L.
Effect of nitrogen, phosphorus and potassium fertilizer on fruit yield and composition of tomato leaves.
J. agric. Food Chem., 1959, **7**: 415-18, bibl. 16.

Yield responses were obtained to N, P and K, although the highest N level (300 lb./acre of N) caused a reduction in yield. Figures are tabulated for leaf contents of N, P, K, Ca and Mg for all treatments. The soil was a unique sand-limestone complex.—Sub-Trop. Exp. Stat., Univ. Fla, Homestead.

3694. Neubert, P.
Untersuchungen über den Einfluss der Stickstoffdüngung auf Reifung, Ertrag und Qualität der Tomatenfrucht. (**Studies on the effect of nitrogen manuring on ripening, yield and quality of tomato fruits.**) [Russian and English summaries ¾ p. each.]
Arch. Gartenb., 1959, **7**: 29-51, bibl. 64.

In a field trial and in two pot trials the effect on tomato fruits was studied of high N applications (up to 320 kg./ha. or 3·2 g./pot), PK applications remaining at a constant moderate level. The results showed that: (1) During ripening, the content of monosaccharides (glucose and fructose) doubled to reach about 50% of the dry weight, the increase being greater from the orange to the red stage of ripeness than from the green to the orange stage. Sucrose occurred in small quantities in green fruits. Titratable acid increased until the orange stage of ripeness and then decreased. The contents of protein N and soluble N compounds decreased very slightly, and that of vitamin C increased, during ripening. The fruit weight rose, owing largely to an increase in water uptake. (2) Ripening was not substantially affected by high N applications. (3) In the field trial yields rose as a result of N applications up to 160 kg./ha., but decreased following higher N applications. The average weight per fruit was increased only by the lowest N application (20 kg./ha.) and decreased at higher N levels. The proportion of large fruits increased as N applications were raised up to 80 kg./ha., but decreased progressively at higher rates. In the pot trials none of the N applications reduced yields. (4) In all the trials high N applications were associated with decreases in monosaccharide and vitamin C contents. Titratable acid, total N and soluble N, however, increased, but protein N increased only slightly.—Inst. PflErnähr. u. Bodenk., Univ. Halle u. landw. Versuchsstat. Leuna-Werke.

3695. Lingle, J. C., and Davis, R. M.
The influence of soil temperature and phosphorus fertilization on the growth and mineral absorption of tomato seedlings.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 312-22, bibl. 21, illus.

In both sand and soil cultures tomato growth was greatest at the highest root temperatures tested (80–85° F.). Percentage dry weight decreased as the root temperature increased. In soil culture the response to P was greatest at the median temperatures (60–75° F.), whereas in sand culture it was greatest at the highest temperatures. In soil culture the concentrations of P, K, Ca, Mg and Na in the plant tissue increased as the soil temperature increased from 50–55° to 70–75°F. P and K concentrations increased over the entire range of temperatures studied, but Na and Ca concentrations were lower at 80–85° than at 70–75° F. The Mg concentration apparently became stabilized at a point below the highest temperature. Similar trends were apparent in sand culture.—Univ. Calif., Davis.

3696. Spurr, A. R.
Anatomical aspects of blossom-end rot in the tomato with special reference to calcium nutrition.
Hilgardia, 1959, **28**: 269-95, bibl. 83, illus.

The extensive literature on blossom-end rot in tomatoes is critically reviewed, and histological and cytological evidence is presented which indicates that localized calcium deficiency is mainly responsible for this disorder. Anatomical aspects are described and illustrated in detail.

3697. Kidson, E. B.
Water-culture experiments on nutritional problems of the tomato.
A.R. Cawthron Inst. 1957-58, 1958, pp. 45-6.

Under high osmotic pressures, obtained by adding sodium sulphate or by using 3 times the standard quantity of major elements, the incidence of cloud was significantly reduced. This reduction was accompanied by a significant decrease in the average weight of fruits and an increase in the average percentage of dry matter in the fruit. Cloud occurred in all treatments in which 3 levels of Cu were combined with 2 levels of B, and there was no relationship between the severity of cloud and the level of either micronutrient.

3698. Kern, H.
Der Einfluss des Lycomarasmins auf den Wasserhaushalt von unterschiedlich mit Eisen ernährten Tomatenpflanzen. **(The effect of lycomarasin on the water balance of tomato plants receiving different amounts of iron.)** [English summary 7 lines.]
Phytopath. Z., 1959, **35**: 232-7, bibl. 7.

In plants with normal or excessive Fe supply, lycomarasmin causes—through its water-soluble, transportable Fe chelates—an accumulation of Fe in certain leaf areas and consequently Fe toxicity with a heavy loss of water. In deficient plants the quantity of Fe available is too small to produce such an effect. [From author's summary.]—Eidg. tech. Hochsch., Zürich.

3699. van den Ende, J.
Magnesiumvoeding van groenten en fruit onder glas. **(Magnesium nutrition of vegetables and fruit under glass.)** [English summary ½ p.]
Meded. Proefst. Groent. Fruit. Glas. Naaldwijk **68**, 1958, pp. 27, bibl. 33, illus.

Magnesium deficiency in glasshouse tomatoes was associated with high levels of soil K; the deficiency was also enhanced by high soil moisture contents. Tomato yields were hardly affected by chlorosis occurring relatively late in the life of the plant, but early chlorosis was apt to reduce yields by 20%. The deficiency was corrected by the application of Mg in the (trickle-)irrigation water, but foliar spray applications of magnesium sulphate were even more effective. High soil K contents were also associated with Mg deficiency in glasshouse vines. The deficiency was successfully corrected by sprays of magnesium sulphate, but regular soil fertilization with Mg is also recommended. Preliminary results on smearing pruning cuts with a paste including magnesium sulphate showed some reduction of chlorosis. Graft chlorosis in cucumbers has symptoms similar to those of Mg deficiency, but is associated with low leaf contents of N, and often of Mn. Graft chlorosis of tomatoes was identical with Mg deficiency.

3700. Stanton, D. J.
Some factors regulating yield, quality and physiological disorders of tomatoes.
A.R. Cawthron Inst. 1957-58, 1958, pp. 47-9.

Six treatments, involving 3 levels of water and 2 levels of N + K gave the following, among other results: The total yield per plant was much greater at the highest rates of watering (51–53 gal. per year) than at the low rate (20–26 gal. per year). Each increase in watering raised the total yield, but quality was reduced with low N + K treatments. Heavy applications of N + K tended to produce more (by weight and numbers) first-grade fruit, especially at high levels of watering. High rates of watering were paralleled by increased cloud; cloud was also more severe with low N + K. Similar but less marked trends were observed with blossom-end rot.

3701. Stanton, D. J.
Liquid feeding of tomatoes by trickle irrigation.
A.R. Cawthron Inst. 1957-58, 1958, pp. 50-3.

In the first season total yields were increased by 3·2 lb. per plant under trickle irrigation, but fruit quality was reduced. On trickle-irrigated plots a small amount of cloud occurred, but large numbers of fruits were on the verge of developing this disorder. In the second season plants grown at low tensiometer readings gave the heaviest yields, but quality was lower than on drier plots.

3702. Čermnyh, L. N.
Special agrotechnical practices for early tomatoes in steam-heated ground. [Russian.]
Dokl. Mosk. s.-h. Akad. im. D.A. Timiryazeva, 1957, No. 28, pp. 362-6, from *Ref. Ž. (Biol.)*, 1958, No. 10, Abstr. 44,122.

In experiments with the tomato variety Gruntovyj Gribovskij plants grown in heated ground under a transparent film cover produced the first crop 35–40 days earlier than those in uncovered ground, and only 10–14 days later than those in a [cool?] glasshouse. Treatment of the flowers of the 1st and 2nd trusses with 2,4,5-T at 25 mg./l. in the early planted crop increased yields by 2 kg./sq. m. and advanced ripening by 12–14 days. The highest yield (12 kg./sq. m.) was obtained from the earliest planting (April 15). Without treatment the highest yield (10·4 kg./sq. m.) was obtained from planting on May 4. In another trial a constant soil temperature was provided electrically throughout the growing period. In the control plot the soil temperature fluctuated between 14 and 18° C. and the yield was 7·1 kg./sq. m. At constant soil temperatures yields in kg./sq. m. were 10·1 at 20° C., 12·0 at 25° C., 12·6 at 30° C., and 13·9 at 35° C., but 40° C. was unfavourable.

3703. Oebker, N. F.
Paper mulch rivals plastic.
Amer. Veg. Gr, 1959, **7**(5): 16, illus.

The use of a kraft paper mulch containing a fungicide increased the early and total yields of tomatoes, and was cheaper, as well as more effective, than black plastic in increasing early and total yields of cucumber. The mulch may be left in the field to decompose after cropping.—Univ. Ill.

3704. (Autry-Hall, F.)
Plastic-mulched tomatoes produce fine yield.
Fruit and Prod., April, 1959, p. 7.

With a black plastic mulch tomatoes yielded 813 lb. of fruit per plot, while from non-mulched plots the crop, harvested 16 days later, averaged only 335 lb.—Terranora Veg. Stat., N.S.W.

3705. Moore, J. F.
Male sterility induced in tomato by sodium 2,3-dichloroisobutyrate.
Science, 1959, **129**: 1783-40, bibl. 6.

Spraying tomatoes with 0·3% sodium 2,3-dichloroisobutyrate (FW-450) at anthesis induced male sterility for 12 days, beginning 12 days after treatment. Only 20% fewer fruits were set on treated plants hand-pollinated with pollen from unsprayed plants than were set on untreated plants. The flowers again showed normal fertility 37 days after treatment. [Author's abstract.]—Campbell Soup Co., Riverton, N.J.

3706. Bode, H. R.
Über den Einfluss des Heteroauxins auf die Kationenzusammensetzung der Blattasche der Tomate. **(The effect of heteroauxin on the cation composition of tomato leaf ash.)**
Planta, 1959, **53**: 212-18, bibl. 17.

The distribution of cations in the leaf ash of young tomato plants showed a maximum of K in the youngest leaves and a minimum of K in the oldest leaves. In the case of Ca the position was reversed. Spraying the whole plant with a solution of indoleacetic acid (10^{-5}, 10^{-6}) caused an increase of 18% in the fresh weight of mature leaves, which was not associated with an increase in the dry weight. Following this treatment the oldest leaves showed a considerable increase in the K content of the ash and the youngest leaves a slight decrease. This reversal in the translocation of K, in a basipetal direction, suggests an acceptor action in respect of K, induced by indoleacetic acid. [From translation of author's summary.]—Lehr-u. ForschAnst. f. Wein-, Obst-u- Gartenb., Geisenheim/Rhein.

3707. Cordner, H. B., and Hedger, G.
Determinateness in the tomato in relation to variety and to application of N-meta-tolylphthalamic acid of high concentration.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 323-30, bibl. 4, illus.

N-meta-tolylphthalamic acid at 400 p.p.m. in single and multiple applications to the foliage of tomato plants caused them to become more determinate. The primary effect of the growth regulator was to delay or to prevent the resumption of growth in the stem following the initiation of the terminal inflorescence. In this way the functioning of the gene for indeterminate growth was neutralized temporarily or permanently. Under these conditions the inflorescence was in a position favourable to the differentiation and growth of its several component parts. This resulted in considerable enlargement of the flower cluster; specifically, more flowers, larger and longer peduncles, and finally the multiplication of the parts of the individual flowers. From these results it appears that the growth habit of the tomato plant is controlled by a single hormone-like substance, which at different levels causes the expression of different degrees of determinateness. Fasciation of the flowers appears to be a part of this system and is most evident in the clusters of extremely determinate plants. [From authors' summary.]—Okla St. Univ., Stillwater.

3708. Krylov, A. V., and others.
Distribution of S^{35}-labelled vitamin B_1 in different parts of the tomato plant. [Russian, with English summary ½ p.]
Fiziol. Rast., 1959, **6**: 296-302, bibl. 15, illus.

The introduction of labelled thiamine through the petiole led to the accumulation of the vitamin in the upper part of tomato plants, especially in the nodes, very little being found in the lower stem, older leaves or roots. In the case of buds and flowers there was a close relationship between intensity of growth and thiamine content, and when these organs were treated with 2,4-D thiamine increased in those which responded to the treatment. Nevertheless, the distribution of thiamine and 2,4-D in the plant was different; the growth substance accumulated mainly in the growing points and flowers, while the vitamin was concentrated chiefly in the upper leaves and stem.

3709. Serini, G.
Tenore in 2-3 butilenglicole ed in acetilmetilcarbinolo e stato di maturazione dei prodotti orticoli. **(The 2,3-butyleneglycol and acetylmethylcarbinol contents in relation the the ripeness of certain horticultural products.)**
Ann. Fac. Agrar. Milano, 1956, 1957, **5**: 85-90, bibl. 9.

Only in tomato was a direct correlation established. None was found in eggplant, potato, carrot, radish, *Capsicum annuum*, *Brassica rapa*, *B. oleracea*, *Cucurbita pepo* or *C. maxima*.

3710. Winsor, G. W., and Massey, D. M.
The composition of tomato fruit. II.—Sap expressed from fruit showing colourless areas in the walls.
J. Sci. Food Agric., 1959, **10**: 304-7, bibl. 5.

Tomatoes having colourless or "waxy" areas in the walls are shown to have a lower content of dry matter than normally ripened fruit. Lower concentrations of total soluble solids, sugars, nitrogenous compounds and titratable acids are also found in sap expressed from "waxy" than in that from normal fruit. The sap of "blotchy" tomato fruit is found to be intermediate in composition between that of normal and of "waxy" fruit. Although these disorders of ripening tomatoes become apparent in the outer fruit walls, accompanying differences in composition can be demonstrated in the inner portions of the fruit. [Authors' summary. For part I, see *H.A.*, 29: 522.]—Glasshouse Crops Res. Inst., Rustington.

3711. Hall, C. B., Dennison, R. A., and Nettles, V. F.
The influence of photoperiod on color development of tomato fruits.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 331-3, bibl. 1.

Mature green tomato fruits subjected [in the ripening room] to a 24-hour photoperiod had significantly higher color values than similar fruits with photoperiod treatments of 2, 4, or 6 hours, but did not differ from fruits exposed for 8 or 16 hours. Fruits subjected to 2 photoperiods of 2 hours each, separated by a 10-hour dark period, did not differ in color value from fruits with a 4-hour daily photoperiod. The fruits in all light treatments had higher color values than those held in the dark. [Authors' summary.]—Fla agric. Exp. Stat., Gainesville.

3712. Boyle, J. S.
The role of tobacco mosaic virus in the internal browning disorder of tomato.
From abstr. in *Phytopathology*, 1959, **49**: 227.

Internal browning occurred in the fruit of 39 out of 40 tomato plants inoculated with tobacco mosaic virus, affecting 20·94% of the total fruit yield. Inoculation with tobacco ring-spot, cucumber mosaic, or an unidentified virus from *Mertensia virginica* resulted in a low incidence of the disorder, not significantly different from that in control plants.

3713. Ebben, M. H., and Williams, P. H.
Brown root rot of tomatoes. I. The associated fungal flora.
Ann. appl. Biol., 1956, **44**: 425-36, bibl. 24, illus.

Basal stem rot, "corky root" and cortical rot of fine roots were involved in brown root rot. The associated fungi are listed. Steaming the soil altered their proportions and markedly reduced the prevalence of *Colletotrichum atramentarium*, the only effective pathogen of established plants among the fungi isolated. Tomato root growth *in vitro* was retarded by filtrates from this fungus and from *Chaetomium cochloides* or *Petriella asymmetrica*, and growth of the root tips in culture was also checked by leachates from loam or from a loam-manure mixture, but these leachates were inactivated by autoclaving.—Glasshouse Crops Res. Inst., Rustington.

3714. Ebben, M. H.
Brown root rot of tomatoes. II. The fungal flora of the rhizosphere.
Ann. appl. Biol., 1959, **47**: 17-27, bibl. 15.

The fungal populations of the soil and rhizosphere of tomatoes were found to be much lower in steamed than in fallowed or untreated plots. The bacterial population, however, when reduced by steaming, was restored by heavy watering. The differences in the soil fungal counts observed in July had disappeared by October, but the untreated plots held more diseased roots, although the number of fungi on the root surfaces were similar at both times in all treatments. The distribution of *Colletotrichum atramentarium* and *Cephalosporium* spp. indicated them to be root infesters.—Glasshouse Crops Res. Inst., Rustington.

3715. García Lagos, R., and Niederhauser, J. S.
Las enfermedades del jitomate en Veracruz. **(Tomato diseases in Veracruz.)**
Agric. téc. México, 1958, No. 6, pp. 29-30, illus.

For control of late blight (*Phytophthora infestans*) on tomatoes, preventive treatments at 7–10-day intervals with dithiocarbamate preparations are recommended for the nursery or field, or for both if high humidity and temperatures favourable to the disease (18–27° C.) persist. Fungicides have not proved very satisfactory against leaf mould (*Cladosporium fulvum*), but the tomato varieties Globelle, Bay State and Vetomold have shown high resistance.

3716. Threlfall, R. J.
Physiological studies on the *Verticillium* wilt disease of tomato.
Ann. appl. Biol., 1959, **47**: 57-77, bibl. 39.

Infection with *Verticillium* wilt decreased the loss of water per unit of leaf area and the stomatal area per plant, although the number of stomata per unit area increased. Resistance to the movement of water was also greater in the affected tissues, being correlated with the blockage of vascular elements with hyphae. The major symptoms of the disease are thought to be due to an increased shortage of internal water.—Imp. Coll., London.

3717. Harding, J. A.
Potato aphid control on tomatoes.
J. econ. Ent., 1959, **52**: 355-6, bibl. 5.

Seven insecticides were applied, each at 1 lb. active ingredient per acre, against *Macrosiphum solanifolii* on tomatoes. Records taken on the 7th day after treatment showed Trithion, ronnel, Diazinon and Dibrom to have given better control than sevin, malathion and Perthane. None of the materials appeared phytotoxic.—Tex. agric. Exp. Stat., Crystal City.

3718. Michelbacher, A. E., and Underhill, J.
Control of tomato leaf miners.
Calif. Agric., 1959, **13**(6): 10, illus.

Control of *Liriomyza* spp. on tomatoes by helicopter spraying was almost as good using an experimental product, Dylox, at ½ lb. of 50% soluble powder, and with Diazinon at 1 qt. of 25% emulsion containing 0·47 lb. of active material, as with 2 lb. of 25% wettable parathion, all treatments being applied in 10 gal. of water per acre.

3719. Riggs, R. D.
Studies on resistance in tomato to root-knot nematodes.
Diss. Abstr., 1959, **19**: 2710, being *L.C. Card No. Mic.* 59-349 of 73 pp.

The factors for resistance or susceptibility to root-knot nematodes (*Meloidogyne incognita*) in tomatoes were present in both tops and roots, but were not translocated across a graft union. Studies involving differences in the proteases, alkaloids and phenols of resistant and susceptible tomato lines gave inconclusive results. Nematode larvae entered the roots of resistant and susceptible plants with equal ease, but in resistant plants further penetration was prevented by the death of tissues surrounding nematode larvae. Galls formed by larvae which did develop in resistant plants were indistinguishable from those formed on susceptible plants. Larvae continuously cultured in resistant plants developed a virulent strain, which caused damage to resistant Hawaii 5229 plants as severe as that caused in the susceptible variety STEP 174 by parent populations.—N.C. St. Coll.

3720. Miwa, T., Saito, Y., and Yamamoto, S.
The effect of plant growth-regulators on the interspecific and intergeneric pollinations in some plants of *Solanaceae*. [Japanese, with English summary ¾ p.]
Bull. Fac. Agric. Univ. Miyazaki, 1958, **4**: 153-65, bibl. 9.

Interspecific hybridization was successful between *Solanum integrifolium* as female and eggplant (*S. melongena*) as male parent, but not reciprocally. The F_1 plants were vigorous, but almost sterile. Tomato pollen effected fruit set in *S. integrifolium*.

A few fruits, mainly seedless, resulted from pollination of tomato by either eggplant or *S. integrifolium.* In all these instances fruit set was increased by the use of growth substances. A few seedless fruits were produced by eggplants receiving pollen from either tomato or *Capsicum annuum. Petunia violacea* set no fruit with the pollen of any of the above species, but in one instance a few fruits were obtained from *S. integrofolia* after pollination by *P. violacea.*

3721. Parker, M. B., Bailey, J. E., and Morris, H. D.
Fertilizers boost bell pepper.
Bett. Crops, 1959, **43**: 6-13, illus.

On a fertile soil with a pH of 5·4 capsicum yields were not increased by fertilizer nutrients or lime. On an acid soil of low fertility capsicum yields in 1955 were increased by NPK, especially when lime was also applied. The absence of K_2O limited yields more than absence of N or P_2O_5. However, there were no yield responses in 1956 to fertilizer applications to a soil of low fertility. In 1957 crop yields after adding complete fertilizer to a low fertility soil averaged 2·9 tons per acre more than on control plots, but when either N, P or K was omitted yields were reduced by about 1·5 tons per acre. P_2O_5 was more important for promoting early development and maturity than for increasing total yields.—Univ. Ga.

Noted.

3722.

a Anon.
Canning peas. The riddle of quality.
Rur. Res. C.S.I.R.O., 1959, No. 27, pp. 10-11, illus.
Australian research on the relations between pea maturity and optimal composition for canning summarized.

b Atabekowa, A. J.
Cytologische Untersuchungen an der Kulturerbse *Pisum sativum.* (**Cytological studies on peas.**)
Biol. Zbl., 1959, **78**: 424-38, bibl. 20, illus.
Studies of anthers, pollen grains, pollen germination and ovules.

c Ben Shaul, Y.
The calcium and magnesium content of germinating lettuce seeds.
Bull. Res. Coun. Israel, Sect. D, 1959, **7D**: 47-50, bibl. 7.

d Blinc, M.
Storage of gamma irradiated potatoes and onions.
Bull. sci. Cons. Acad. R.P.F. Belgrade, 1959, **4**: 102.
An irradiation dosage of 7,000 r stopped sprouting in onions.

e Boots Pure Drug Co.
No check to plants by new dust for *Botrytis.*
Grower, 1959, **52**: 23, illus.
No growth check with this lettuce *Botrytis* control.
Comm. Gr, 1959, No. 3319, p. 97.
Recommendations for applying Allisan [see also abstract 3671].

f Bradley, G. A.
Magnesium deficiency in some vegetable crops.
Ark. Fm Res., 1958, 7(4): 10, illus.
With special reference to cantaloupes and rainfall.

g Buxton, E. W., and others.
The resistance of pea varieties to *Fusarium* wilt.
Plant Path., 1959, **8**: 39-45, bibl. 10, illus.
Out of 146 varieties, the 77 resistant in Britain include few that are commercially popular. [See also abstract 3632.]

h C.S.I.R.O., Australia.
Fusarium wilt- and nematode-resistant Merbein tomato hybrids.
Rur. Res. C.S.I.R.O., 1959, No. 27, pp. 6-9, bibl. 3, illus.
Merbein Early, Merbein Mid-season and Merbein Canner.

i Danielson, C. E.
Chemical analyses of ripening peas.
Physiol. Plant., 1959, **12**: 176-82, bibl. 6.
Monosaccharides and compound sugars in seeds and hulls during ripening.

j Dobroljubskij, O. K.
The effect of micro-elements on the development of vegetable crops. [Russian.]
Sad i Ogorod, 1959, No. 4, pp. 27-9.
Reaction of tomato, eggplant, cucumber and pea to Co, Zn, Cr, Mn, Ni, Mo and B reviewed.

k Erickson, H. T.
Bulb onions from seed: an evaluation of hybrids and varieties for Indiana.
Res. Bull. Purdue Univ. agric. Exp. Stat. **672**, 1959, pp. 8, illus.

l Geissler, T., and Kurnoth, P.
Zweckmässige Stickstoffdüngung im Feldgemüsebau. (**Nitrogen fertilizers in vegetable production on a field scale.**)
Dtsch. Gartenb., 1959, **6**: 98-100, illus.
For cabbages, leeks and spinach.

m Goode, M. J., and Reading, G. D.
Control of cucumber anthracnose.
Ark. Fm Res., 1959, **8**(1): 10, illus.
Maneb as spray or dust effective in 2 years' tests against *Colletotrichum lagenarium.*

n HAHN, P.
Durch richtige Sortenwahl—Steigerung der Marktproduktion bei der Buschbohne. (**Increased yields of dwarf beans due to the choice of the right variety.**)
Dtsch. Gartenb., 1959, **6**: 96-8, illus.
Nine varieties and their requirements discussed by the Zentralstelle für Sortenwesen, Berlin.

o HONMA, S.
A method for celery hybridization.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 345-8, bibl. 3, illus.

p IWAMI, N.
Ecological studies of lettuce. I. Development of the floral organs. [Japanese, with English summary ¼ p.]
J. hort. Ass. Japan, 1959, **28**: 35-8, bibl. 6, illus.
Successive stages in bolting.

q JACOBONI, N.
Il carciofo romanesco. Biologia e coltivazione. (**The Roman [globe] artichoke. Biology and cultivation.**)
Ann. Fac. Agrar. Perugia, 1958, **13**: 342-72, bibl. 42, illus.

r JENSEN, J.
Forsøg med sorter og stammer af frilandstomater 1954-57. (**Trials with varieties and strains of outdoor tomatoes 1954-57.**) [English summary 30 lines.]
Tidsskr. Planteavl, 1959, **63**: 45-60.
Comprising bush and staked tomatoes.

s JENSMA, J. R.
Rassenproeven met savooiekool. (**Variety trials with savoy cabbage.**) [English summary 1 p.]
Meded. Inst. Vered. Tuinbouwgew. **146**, 1959, pp. 34, illus.

t KAMEL, A. H., AND ABU SHAHBA, B.
Protection of stored seeds in Egypt.
Bull. Ext. Dep. Minist. Agric., Egypt **295**, 1958, pp. 16, bibl. 10.
Vegetable seeds included; preventive (disinfection) and curative (fumigation) measures discussed.

u KASMIRE, R. F.
Observations on the marketing of Merced area summer tomatoes at some eastern terminal markets 1957.
[*Mimeo. Publ.*] *Univ. Calif.*, undated, pp. 11, bibl. 1.
Mature green tomatoes transported in cars using half-stage icing (initial ice plus 1 or 2 icings in transit).

v KAVANAGH, T.
Virus diseases of crucifers in Ireland.
J. Dep. Agric. Dublin, 1957-58, **54**: 157-68, bibl. 22, illus.
A survey covering brassicas, wallflowers and stocks, with recommendations on preventive measures.

w KAWAMURA, S.
Relation of maturity to the composition of broad bean seeds. III. Amylose content of starch.
J. agric. Chem. Soc. Japan, 1958, **32**: 749-51, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-329.
For part II, see *H.A.*, 27: 1493, and for related work, *H.A.*, 28: 2717b.

x KULIK, M. M.
Studies on pink root rot of onions and shallots and the causal organism *Pyrenochaeta terrestris* (Hansen) Gorenz et al.
Diss. Abstr., 1959, **19**: 3095-6, being *L.C. Card No. Mic.* 59-1538 of 137 pp.
Results from chemical control tests largely inconclusive.

y LAWS, E. Q.
The determination of Phosdrin in vegetables.
Analyst, 1959, **84**: 323-4, bibl. 1.
Chemical and anticholinesterase methods compared on kale and sugar beet leaves.

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Osservazioni sulla coltivazione del *Sechium edule* Sw. a Firenze. (**Observations on the cultivation of *Sechium edule* in Florence.**)
Riv. Agric. subtrop. trop., 1959, **53**: 197-202, bibl. 4, illus.
A promising vegetable crop for introduction to Tuscany.

3723.

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Recent improvements in crop cultivation and management.
J. roy. hort. Soc., 1959, **84**: 222-34, illus.
Some results of a work study and the Fernhurst bed system of market gardening [see also *H.A.*, 29: 2024].

b MINISTRY OF AGRICULTURE, LONDON.
Leatherjackets.
Adv. Leafl. Minist. Agric. Lond. **179**, revised 1958, pp. 4, illus.
Control by sprays, dusts, baits or traps, in farm and garden crops, lawns and turf.

c MINISTRY OF AGRICULTURE, LONDON.
Wireworms.
Adv. Leafl. Minist. Agric. Lond. **199**, revised 1958, pp. 6, illus.
Damage to vegetables, control by cultivation and chemicals.

d Moffitt, A. L.
Asparagus growing in Hawke's Bay.
N.Z. J. Agric., 1959, **98**: 459-67, bibl. 2, illus.

e Niedieck, B.
Eine Schnellmethode zur Gesamtoxalatbestimmung in Blattgemüsen. **(A rapid method for the determination of total oxalates in leafy vegetables.)**
Züchter, 1959, **29**: 184-5, bibl. 7.
Oxalic acid contents of spinach and lettuce tabulated.

f Nieuwhof, M.
Ervaringen op het I.V.T. met de veredeling van spitskool. **(Results from breeding head cabbage at the I.V.T.)**
Zaadbelang, 1958, **12**: 158-9, 173-4, 204-5, 218-19, 236-8, 250-1, illus., reprinted as *Meded. Inst. Vered. Tuinbouwgew.* **137**.

g Nolte, H.-W.
Über die Abhängigkeit der Wirkung von DDT- und HCH-Einstreumitteln gegen *Acanthoscelides obtectus* Say. von der Temperatur. **(The effect of temperature on the action of DDT and BHC dusts used for controlling *Acanthoscelides obtectus*.)**
NachrBl. dtsch. PflSchDienst., Berlin, 1959, **13**: 94, bibl. 2.
Bean seeds are not protected in storage, unless the temperature is above 12° C.

h Nourish, W. H.
Some observations on the manuring of brussels sprouts.
Worc. agric. Chron., 1959, **27**: 171-5.
Two basic fertilizer formulas are given for brussels sprouts.

i Plantenziektenkundige Dienst, Wageningen.
Landslakken. **(Slugs and snails.)**
Vlugschr. PlZiekt. Dienst, Wageningen **74**, 1959, pp. 8, illus.
Control mainly by metaldehyde baits and sprays; calcium cyanamide also promising [see also *H.A.*, 26: 2757 and 27: 1351].

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Some physiological aspects of vegetable and fruit handling.
Reprinted from *Food Tech. in Aust.*, 1958, **10**: 407-17.
A review of research on post-harvest physiology, storage and deterioration.

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Cabbage insects succumb to new insecticides.
Ark. Fm Res., 1959, **8**(1): 7.
Dylox and Thiodan outstanding, mainly against cabbage looper.

l Rutledge, W., III.
Asparagus. Revolutionizes operations.
Amer. Veg. Gr, 1959, **7**(5): 25, illus.
A straddle machine carrying one man to harvest asparagus, garlic, etc.

m Scott, F. H., and Watts, A. V.
Fertilizing vegetable crops in Virginia.
Bull. Va agric. Ext. Serv. **212**, revised 1959, pp. 12.
Fertilizer requirements and optimum soil pH for each crop.

n Seale, A. D., Jr., King, R. A., and Martin, L. C.
Vegetable prices and market structure in southeastern North Carolina.
Tech. Bull. N.C. agric. Exp. Stat. **134**, 1958, pp. 81.
Centralized grading appeared to offer the most promise of improved returns.

o Siewiński, A., Mejer, S., and Kocór, M.
Zawartość tomatyny w uprawnych pomidorach i prosta metoda otrzymywania tomatydyny z liści pomidorów. **(The content of tomatine in tomatoes and a simple method of preparing tomatidine from tomato leaves.)**
Przemysł Chem., 1957, No. 9, pp. 543-4, from *Polish tech. Abstr.*, 1958, No. 2, Abstr. 5,416.

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Stav pěstováni žampionů a jeho výzkumu v cizině a u nás. **(Mushroom cultivation and research in Czechoslovakia and abroad.)**
Sborn. čsl. Akad. zeměd. Věd, Rostl. Výroba, 1958, **31**: 1651-8, bibl. 125.

q Touzeau, J.
Essais de lutte contre l'acariose bronzée de la tomate en Tunisie en 1957. **(Trials on the control of tomato russet mite in Tunisia in 1957.)**
Fruits et Prim., 1958, **28**: 186-91, bibl. 4.
Toxaphene gave best control of *Vasates lycopersici*; sulphur less effective and malathion doubtful.

r Vance, B.
How to grow asparagus.
Ia Fm Sci., 1959, **13**: 227-9, illus.

s Watts, V. M., and Bittle, C. M.
The Hope Diamond melon.
Ark. Fm Res., 1958, **7**(1): 2, illus.
A superior water-melon variety resistant to *Fusarium* wilt and anthracnose.

t WAY, M. J.
The use of insecticidal seed dressings.
A.R. Rothamsted exp. Stat. 1958, 1959, pp. 214-22, bibl. 37.
A review.

u WERLE, E., BEAUCAMP, G., AND SCHIRREN, V.
Über die Aminoxydase von Erbsenkeimlingen und ihre Bedeutung fur die Keimung. **(The aminoxidase of pea seedlings and its significance in germination.)**
Planta, 1959, **53**: 125-33, bibl. 11.

v WINSTEAD, N. N., RIGGS, R. D., AND STRIDER, D. L.
Research attacks pepper diseases.
Res. and Fmg N.C., 1959, **17**(3): 11, illus.
Notes on bacterial and fungus diseases and fungicides found effective against them. [See also *H.A.*, 29: 559w.]

w YEN, D. E., AND NEWHOOK, F. J.
V-548—a new glasshouse tomato for release in 1959.
N.Z. J. Agric., 1959, **98**: 487-8.
New glasshouse tomato, V548, to be released this year.
N.Z. Comm. Gr, 1959, **14**(8): 4-7, illus.
Resistant to leaf-mould, with a low incidence of blotchy ripening, and yields similar to those of Potentate.

x ZÁVADA, J., AND VALENTA, V.
Root formation in plants infected with yellows-type viruses.
Biol. Plant., Prague, 1959, **1**: 123-5, bibl. 1, illus.
Rooting was inhibited in tomato cuttings infected with stolbur or witches' broom viruses.

TOBACCO.

General.

(*See also* 3791v, 4016, 4139.)

3724. BIRKHEAD, J. W., AND DAVIS, A. B.
The position of oriental tobacco in World production and trade.
Foreign Agric. Rep. U.S. Dep. Agric. **113**, 1958, pp. 66.

Oriental or aromatic tobaccos account for about ⅛th of the World's total production of all types of tobacco, but their proportion of World exports amounts to more than ¼ of the total entering international trade. Production and exports of oriental tobaccos are rising, and they are competing strongly with U.S. flue-cured tobaccos in European markets. This report gives details of production and exports country by country. An appendix provides a glossary of terms used with oriental tobaccos.

3725. EMSLIE, G. B.
Turkish tobacco. A cash crop for the African farmer.
Agric. Bull. N. Rhod. Dep. Agric. **15**, 1958, pp. 41, illus., 2s.

This is a useful addition to the N. Rhodesian set of bulletins on various aspects of tobacco production. The author deals in a practical manner with the cultivation of Samsun types of Turkish tobacco, from an appreciation of climate and siting a garden *via* seedbed and field work to curing, baling and marketing. His points are driven home with illustrations which make up nearly half the bulletin. [See also *Bull.* 6 of this series, The production of Turkish tobacco in Northern Rhodesia.]

3726. MATHEWS, G. R.
Would you like to grow aromatic tobacco?
Bull. Va polytech. Inst. agric. Ext. Serv. **259**, 1959, pp. 16, illus.

Notes, supported by many excellent illustrations, describe the following stages in the production of aromatic tobaccos: Plant production, transplanting, spacing, fertilization, cultivation, harvesting and stringing, curing, bulking, baling and marketing.

3727. MATHEWS, G. R., AND MATTHEWS, E. M.
Quality flue-cured tobacco.
Circ. Va Polytech. Inst. agric. Ext. Serv. **386**, 1959, pp. 7.

Recommendations for the production of high quality flue-cured tobacco are given, based on the work of the Bright Tobacco Research Station of the Agricultural Experiment Station, V.P.I. After stressing the importance of good soil, suitable varieties are listed according to their body, flavour and aroma, and their resistance to important diseases. Two-year rotations are preferred to annual plantings, a tobacco, wheat and red top sequence being the most remunerative. Fertilizer dosages are laid down for different classes of soil, and magnesium limestone suggested where the pH is below 5·4. There is also a brief note on spacing, topping, desuckering and harvesting.

3728. D.S.I.R., N.Z., AND CAWTHRON INSTITUTE.
Tobacco Research. Annual Report for 1957-58, pp. 2.

Seedling beds: Vapam and Mylone 85 W drenches gave excellent weed control, but were phytotoxic even when applied 4 weeks before sowing; allyl alcohol gave less satisfactory weed control, but could be applied 10 days before sowing without harming the seedlings. Ferbam at 3 lb./50 gal. and thiram at 1½ lb./50 gal. gave excellent control of *Botrytis* and *Sclerotinia* rots. *Sclerotinia* was also controlled by captan (1½ lb./50 gal.) and by 20% PCNB dust, but the latter checked seedling growth. *Use of fertilizer:* No improvement in yield or quality was obtained by increasing the fertilizer application above 1,200 lb./acre. Nitrate of soda applied as side dressings was the best of several N forms, and 4% N resulted in a higher yield and leaf index than 3% N. Manganese sulphate applied at 100 lb./acre for 4 successive years caused a reduction in yield but not in quality. Sodium molybdate applications produced a bright, attractive leaf. *Varieties and plant breeding:* The highest yield and leaf index were produced by Riwaka 4; resistance to black root-rot, mosaic, and verticillium is being tested. *Chemical control of laterals:* A 1% solution of MH gave excellent control of laterals when sprayed on the upper leaves at a rate of 27 gal./acre. *Disease investigations:* Chloropicrin reduced *Verticillium* infection considerably. Field application of EDB gave good control of root-knot nematodes. *Chemical analyses:* With Virginia Gold the highest sugar contents in a spacing experiment occurred in plants spaced at 18 in. Drier irrigation regimes produced higher levels of Ca, Mg and reducing sugars; at 60% field capacity Mg was reduced but K was increased in the cured leaf. Borax applied to 3 varieties had little effect on contents of N and reducing sugars, but leaf B contents were increased. Copper sulphate and sodium molybdate caused a desirable reduction in the proportion of N present in water insoluble forms. Analyses of 9 varieties showed Dixie Bright 24 to contain most K, and Virginia 45 and Chatham to contain most N. [See also *H.A.*, 29: 999 and 4139.]

Breeding and varieties.

(*See also* 3791a, f, g, j, q.)

3729. Goodspeed, T. H., and Thompson, M. C.
Cytotaxonomy of *Nicotiana*. II.
Bot. Rev., 1959, **25**: 385-415, bibl. 47.

This paper is a supplement to work published in 1945 [see *H.A.*, 16: 825]. It covers species cytology, apomixis, and F_1 hybrid cytology. The origins and relationships of the 14 sections of the genus are shown diagrammatically.—Univ. Calif., Berkeley.

3730. Bortner, C. E., Hamilton, J. L., and Wallace, A. M.
Difference between two burley tobacco varieties when grown with the same level of fertility, and tested under a variety of fertility practices.
Pap. 12th Conf. Tob. Chem. Res., Durham, N.C., 1958, No. 27, from *Tob. Abstr.*, 1958, **2**: 562-3.

Burley 21 and Kentucky Experimental No. 4 were planted on fertility plots of long standing, each variety being planted over half of each treatment. Measurements were made of yield, value and composition. The greatest difference between the two varieties was in their ability to take up K, B21 consistently taking up more K than Ex. 4. This was reflected in the quality of leaf, the value per lb. being greater in B21, particularly where K was limiting. N also was higher in B21. P and Mg were generally higher in Ex.4, but varied with treatment. The difference between the two varieties in the concentration of Ca and total alkaloids was variable. However, the ratio of total N to Ca was higher in B21 than in Ex. 4 on all plots. There was a difference between the two varieties in mineral content from the bottom to the top of the plant.

3731. Heggestad, H. E., and Neas, M. O.
The disease resistant varieties Burley 11 A and 11 B and observations of tobacco black shank in Tennessee.
Bull. Tenn. agric. Exp. Stat. **261**, 1957, pp. 25, from *CORESTA Inf. Bull.*, 1958, No. 3, Abstr. 1,747.

Burley 11 A and 11 B may be successfully grown in soils moderately infested with *Phytophthora*, but soils more heavily infested should be submitted to crop rotation. These two varieties are also resistant to *Fusarium* and *Thielavia*. Burley 11 B yields more and is favoured by manufacturers.

Seeds and seedling production.

(*See also* 3782.)

3732. Kincaid, R. R.
Tobacco seed storage for 25 years.
Bull. Fla agric. Expt. Stats **593**, 1958, pp. 10, from *Tob. Abstr.*, 1959, **3**: 57.

Tobacco seeds maintained high viability when stored for 25 years in tight containers, either refrigerated or desiccated or both. Seeds stored in paper envelopes or cloth bags in the laboratory deteriorated rapidly, while those in a refrigerator maintained viability for 15 years. Free access of air appeared unfavourable to the maintenance of viability for more than 15 years. Seeds maintained high viability for 13 years when stored over a sulphuric acid solution or calcium chloride which kept their apparent moisture content below 9% in the refrigerator and below 5% in the laboratory. The lowest sulphuric acid concentrations found to maintain high viability for 13 years was 48% in the refrigerator and 65% in the laboratory. Germination tests made at alternating temperatures of 24° C. and 5° C. gave higher average results than those made at a constant temperature of 24° C. Seeds, which maintained high viability in storage for 13–14 years under various conditions, followed by one year in paper envelopes, gave about the same germination as fresh seeds after one year's storage in paper envelopes or cloth bags in the laboratory. [From author's summary.]

3733. Collins, J. C.
Tobacco nurseries.
Agric. Bull. N. Rhod. Dep. Agric. **9**, 1955, pp. 51, illus., 3s. 6d., [received 1959].

A grower's manual on the establishment and maintenance of tobacco seed beds and on the control of the pests and diseases likely to be encountered. It is an eminently practical publication.

3734. Shaw, L.
What's the best tobacco seeding rate?
Res. and Fmg N.C., 1959, **17**(3): 5, illus.

In studies carried out at Waynesville since 1954 burley tobacco seeds were sown at 9 rates ranging from $\frac{1}{32}$ oz. to 1 oz. per sq. yd. The results indicate that there is little increase in the yield of transplantable plants at rates above $\frac{3}{8}$ oz. per sq. yd., and that, as the average seedling density in seed beds increases, so both survival and rate of establishment decline. The optimum seed rate would appear to be between $\frac{1}{8}$ and $\frac{1}{4}$ oz. per sq. yd.

3735. Oseledec, N. N., Micenko, E. A., and Ivanova, I. D.
Raising tobacco seedlings under synthetic film. [Russian.]
Tabak, 1959, **20**(1): 46-7, illus.

The average daily temperatures in frames under the polyamide film PK-4 "Perfol" were about 2 to 4° C. higher than under glass. The growth of tobacco seedlings was most vigorous under the film, though the final yield and quality was similar to that of plants raised under glass. Production costs were lower with the film.

Rotations and nutrition.

(*See also* 3552, 3730, 3751, 3766, 3778, 3783, 3791h.)

3736. Collins, J. C., and Watson, W. J. D.
Crop rotation in the production of tobacco.
Agric. Bull. N. Rhod. Dep. Agric. **8**, 1955, pp. 22, bibl. 2, illus., 2s., [received 1959].

The authors discuss the necessity of crop rotation to keep the soil in good heart, discourage eelworms and help towards the production of high quality tobacco. They list crops, some varieties of which are known to be resistant to nematodes, and briefly recount their characteristics. The crops include cotton, edible canna, cowpeas (*Vigna catjang*), grasses, groundnuts, kaffir corn (*Andropogon sorghum* var. *vulgare*), kudzu vine, maize, munga (*Pennisetum* spp.) soya bean, sunnhemp and velvet beans. Ten examples are given of how these can be fitted into an 8-year tobacco rotation to the best advantage of the tobacco and the soil. Most of the rotations include 2- or 3-year grass leys.

3737. Ingham, J. S. W.
Choice of a grass for tobacco rotations.
Rhod. Tobacco, 1959, No. 18, pp. 6-7.

Experiments at Kutsaga and Trelawney have shown grass leys to be more suitable for tobacco rotations than rotations involving crops. Katambora rhodes, green panic and M'lanje grasses compared favourably with Ermelo lovegrass in a 3-year rotation of 1 year in tobacco and 2 years in grass, but Setaria Kazungula grass gave significantly lower yields.

3738. Nichols, B. C., Bowman, D. R., and McMurtrey, J. E., Jr.
Response of burley tobacco to fertilization.
Bull. Tenn. agric. Exp. Stat. **280**, 1958, pp. 25, from *Tob. Abstr.*, 1959, **3**: 9.

Nitrogen and K_2O, each at 120 lb. acre, improved yield, quality and value, but P_2O_5 at 60 lb./acre on a highly phosphatic soil depressed yield and quality. Increased N tended to increase nicotine and Ca and to decrease P and K in cured leaf. Potash decreased Ca and increased K in cured tobacco. Farmyard manure at 10 tons/acre increased yields by almost 500 lb./acre and increased K, but it also supplied too much Cl.

3739. Landrau, P., Jr., and others.
The influence of fertilizers on tobacco yields. [Spanish summary $\frac{3}{4}$ p.]
J. Agric. Univ. P.R., 1959, **43**: 56-68, bibl. 7, illus.

Experiments were carried out on heavy acid clay soils (pH 5·1–5·6) using Virginia 12 tobacco, and showed significant responses to 50 lb./acre each of N and P_2O_5, but not to K. A single application at planting time was the equal of one 10 days later or 2 split applications, and ammonium sulphate proved better than, or equal to, any other source of N. A dressing of 1 ton of lime significantly increased yields in 3 experiments on one soil, but failed to do so in 2 others on different soils, whereas gypsum alone or with lime was without effect on all soils. Minor elements were ineffective. Higher yields and greater fertilizer responses were obtained with increasing rainfall.

3740. Donadoni, S., and Tombesi, L.
Studi e ricerche sui tabacchi intertropicali. **(Investigations on "intertropical" tobaccos.)** [English summary 1 p.]
Tabacco, 1958, **62**: 371-81, bibl. 3.

Work has been in progress since 1953 in Umbria to promote better fertilizer techniques using *Nicotiana tabacum* cv Scafati 7. The object has been to determine: (1) the relation between the composition of leaf tissues and the content of assimilable elements in the soil after applying fertilizer; and (2) the relation between the chemical composition of the product obtained and its combustibility, and in consequence the variability in combustibility resulting from the fertilizers used. It was found that the K in the soils of the experimental area was highly insoluble and that montmorillonite clay was prevalent. As regards leaf tissues the composition of the base and middle leaves was found to differ irrespective of the fertilizer applied, the middle ones showing a higher protein and K content. Sugar, protein and citric acid contents did not appear to be affected by mineral nutrition. With regard to the final product a relationship was established between the exchangeable K_2O of the soil and that found in the ash, and it was further found that there was more CaO in those products which showed the poorest combustibility. Finally, it was discovered that, under the climatic and soil conditions obtaining, soil contents of 800 kg./ha., 600 kg./ha. and 250 kg./ha. of exchangeable K_2O corresponded with good, moderate and poor combustibility.

3741. De Roo, H. C.
Nitrogen sources for Connecticut tobacco. A report on the co-operative tests of 1958.
Bull. Conn. agric. Exp. Stat. **623**, 1959, pp. 12, bibl. 4.

The purpose of these tests was to determine the most economical forms of nitrogen fertilizing. It was found that water soluble sources such as ammonia, nitrate and urea, if supplemented by a side dressing of less soluble compounds such as urea-formaldehyde, were almost as effective in producing high yields of high quality leaf from field grown tobacco as the more expensive cotton-seed meal. With shade grown tobacco the results were inconclusive. It is suggested that under some conditions winter cover crops or farmyard manure might take the place of slow-acting N side dressings.

3742. McCants, C. B., and Woltz, W. G.
Fumigated soil needs nitrate nitrogen.
Res. and Fmg N.C., 1959, **17**(3): 4, illus.

Three years' trials with flue-cured tobacco fertilized with ammonium and nitrate N showed that nitrate N was much superior when the soil had been fumigated. On unfumigated soils there was little difference between the two types of N. Where soil has been fumigated in either seedbeds or fields, at least 25% of the N supplied should be in the form of nitrate, but in seedbeds it should not exceed 40%.

3743. Takahashi, T., and Yoshida, D.
Interrelation of various ions in absorption by the tobacco plant. III. Relation of magnesium to the phosphorus level in culture solution. IV. Relations among magnesium, potassium and calcium in culture solution. [Japanese.]
Nippon Dojô-hiryogaku Zasshi, 1957, **27**: 463-7, 468-71, from *CORESTA Inf. Bull.*, 1958, No. 2, Abstrs 1352 and 1353, and *Tob. Abstr.*, 1958, **2**: 308.

A high supply of P induced Mg deficiency in the plant. Adding Mg increased the leaf content of Mg and of acetone-soluble substances. Mg affected the metabolism of N and carbohydrates. Mg deficiency appeared when molar ratios were above 5 for P/Mg and above 10 for K/Mg and Ca/Mg. Large supplies of K or Ca induced Mg deficiency; they reduced the leaf content of Mg and of substances soluble in alkali and in acetic acid.

3744. Okuda, A., and others.
Studies of crop nutrition using radioactive potassium as a tracer.
Mem. Kyoto Univ. Res. Inst. Food Sci. **15**, 1958, pp. 16-22, from *Tob. Abstr.*, 1959, **3**: 110.

Compared with tobacco plants grown at standard K levels, plants that had been grown at low K levels absorbed more K^{42} from root applications, transported more to the shoots and accumulated greater amounts in the upper parts of the leaves. Foliar applied K^{42} was translocated more rapidly in bean plants than P^{32}.

3745. Marcelli, E.
Interessante manifestazione di "frenching" in concomitanza di alterazioni da carenza potassica su tabacco. **(Interesting manifestation of "frenching" in association with symptoms of potassium deficiency in tobacco.)**
Osserv. Region Fitopatol. Ricerche Osserv. Divulg. Campania ed. Mezzogiorno, 1957, **13/14**: 107-17, illus., from *Tob. Abstr.*, 1958, **2**: 392.

Virginia Bright tobacco plants developed frenching, together with symptoms of K deficiency. Soil applications of K caused the deficiency symptoms to disappear and markedly reduced frenching. Stable manure also largely reduced frenching, though not as much as K; mixtures of N, P and K had a similar effect.

3746. Pastýrik, L., and Priehradný, S.
Metabolizmus listov tabaku v zavislosti od niektorých mikroelementory. **(The effect of microelements on metabolism in tobacco leaves.)** [Russian and German summaries.]
Biol. Práce, 1956, **2**(11): 1-29, from *Ref. Ž.* (*Biol.*), 1958, No. 7, Abstr. 29,963.

The application of a mixture of 13 trace elements (B, Mn, Cu, Zn, I, Br, Ti, Sn, Li, Ni, Co, Mo and Cr) increased the content of monosaccharides in tobacco leaves by 28·3% and that of disaccharides by 34·6%. The treatment also increased the K content and the total effect of these changes was improved quality.

Soil moisture and irrigation.

3747. Ishitoya, K., and others.
Studies on the effect of the physical characters of soil on the growth of tobacco plants. I. Relationship between the moisture content of soil and the growth of tobacco plants. II. The effect of the oxygen concentration in soil on the growth of tobacco plants. III. Effect of the moisture content of soil at four growth stages of tobacco plants.
Bull. Okayama Tob. Exp. Stat., 1955, No. 9, pp. 1, 5 and 11, from *Abstr. Res. Japan Monop. Corp., Tokyo*, 1958, No. 1, Abstrs 0071-73.

Tobacco plants were grown on soils of 40, 60 and 80% water-holding capacity. Those grown on the 60% soil showed greater leaf dry matter, root growth and C/N ratios than the others. In the second experiment plants were grown with restricted oxygen and with added CO_2. Growth was reduced when the soil O_2 concentration fell below 5% and in the plot with added CO_2. Absorption of minerals, including K and NH_4-N, was also less with reduced aeration. In the third trial, in addition to differential effects during growth, a high moisture content of the soil was accompanied by reduced leaf contents of N, nicotine and protein, but no such effects were observed in the stem or root.

3748. HIGASE, S.
Physiological studies on the flower formation of tobacco. I. Effects of water-logging after transplanting on the developmental responses of tobacco. [Japanese, with English summary.]
Proc. Crop. Sci. Soc. Japan, 1958, **27**: 299-300, from *Tob. Abstr.*, 1959, **3**: 177-8.

In the field, and also in the greenhouse after the plants had produced more than 10 leaves, water-logging caused a reduction in leaf number and advanced flowering. In greenhouse seedlings with 8 leaves flowering was retarded and the leaves showed "frenching" symptoms.

3749. WILLIAMS, F. W.
Evaluating irrigation in flue-cured tobacco production.
From abstr. in *Va J. Sci.*, 1957, **8**: 264, from *Tob. Abstr.*, 1958, **2**: 390-1.

In a study of 55 pairs of farms, half irrigated and half not irrigated, it was found that a little over 3 in. of water applied per acre, at a cost of about $15 per acre-inch, produced about 250 lb. of additional tobacco per acre.

3750. WALKER, E. K., AND VICKERY, L. S.
Some effects of sprinkler irrigation on flue-cured tobacco.
Canad. J. Plant Sci., 1959, **39**: 164-74, bibl. 14.

Supplemental irrigation improved the yield, quality and maturity of flue-cured tobacco for 4 consecutive years, although by a comparatively small amount in one year because of favourable distribution of rainfall. Neither yield nor quality was improved by applications of water in more than optimum amounts. Irrigation according to time intervals or growth stages was unsatisfactory. Thornthwaite evapotranspiration estimates and resistance blocks for determining soil moisture were found to be suitable methods of determining irrigation needs. Leaves from irrigated plots contained less total N, total alkaloids and petroleum ether extract, but more total sugars, K and Cl, than leaves from unirrigated plots. The P content of the leaf was unaffected by irrigation. Irrigation had little effect on leaf thickness, length of burn, filling power and strip yield. [From authors' abstract. For a preliminary note on this work see *H.A.*, 28: 3811.]—Canada Dep. Agric., Delhi, Ont.

3751. TOPALOV, V.
Irrigation of flue-cured tobaccos in the region of Levskigrad-Kazanlyk under differential fertilization conditions. [Bulgarian.]
Bŭlgar. Tjutjun, 1958, **3**: 244-59, from *Tob. Abstr.*, 1958, **2**: 565.

For the entire growth period a total of 5,300 m^3/ha. water was required, or an average daily amount of 50 m^3/ha. Half of this was available as precipitation, the rest being supplied by irrigation. The best irrigation schedule maintained soil moisture from transplanting to flowering at 90% of field capacity and from flowering to first priming at 80%. Six to seven irrigations at 17–22-day intervals were required during both these periods. With this, the following fertilizer rates were required: 10 tons organic manure, 160 kg. ammonium nitrate, 140 kg. granulated superphosphate, and 120 kg. potassium phosphate.

Growth phenomena and desuckering.

3752. WENT, F. W.
Use of the phytotron in studying the growth of the tobacco plant.
From abstr. in *Cigar Manuf. Ass. Res. Seminar*, Washington, D.C., 1958, from *Tob. Abstr.*, 1959, **3**: 114.

Root growth was most abundant at relatively low temperatures, whereas higher temperatures favoured leaf production. Optimal day and night temperatures were established for several tobacco varieties.

3753. TOKITSU, T., MURAOKA, Y., AND OKA, M.
On the functional differentiation of tap roots and adventitious roots in tobacco plants.
Proc. Crop Sci. Soc. Japan, 1957, **26**: 53-4, from *Tob. Abstr.*, 1959, **3**: 53.

Experiments with red ink and nitrogenous substances showed that the lower leaves are nourished by the tap root *via* the inner xylem, and the upper leaves by adventitious roots *via* the outer layers of xylem.

3754. STEINBERG, R. A.
Comparison of daylength and temperature responses in *Nicotiana* and its taxonomic sections.
Amer. J. Bot., 1959, **46**: 261-8, bibl. 9, illus.

All the 57 species tested produced flowers and viable seed under at least one combination of short or long days with constant warmth (25° C.)

or with lower and diurnally fluctuating temperatures (20–10° C.). In some species the day-length response was the same under either temperature regime, but in the majority there were differences, in some instances very marked. The day-length flowering ratio (defined as the number of days from sowing to first flower opening under short-day conditions, divided by the corresponding number under long days) was in most instances lower under cool than under warm conditions, particularly in long-day species, which tended to become day-neutral, but in a few of these the long-day response was enhanced at reduced temperature. The ratio in some short-day species tended to increase toward 1 (day-neutral), but in others it was unchanged or decreased by the lower temperature conditions. A similar variety of temperature responses was shown by day-neutral species. In *N. tabacum* the short-day response was more marked in the cool than in the warm environment.

3755. SCARASCIA-VENEZIAN, M. E.
Effetti dell'applicazione di acido giberellico a piante di tabacco. **(Effects of gibberellic acid on tobacco plants.)**
Tabacco, 1959, **62**: 363-70, bibl. 16.

GA was applied to burley tobacco plants as follows: (1) as a 0·02% aqueous solution; (2) as a 1% aqueous solution; (3) dissolved in methylcellulose at 1,250 p.p.m.; and (4) dissolved in lanoline at 2,500 p.p.m. Treatments (1) and (2) were repeated twice, whereas (3) and (4) were only given once. Each of the plants receiving treatments (1) and (2) received 10 c.c. of solution. The (4) plants received 0·5 mg. of lanoline and the (3) plants received 2·5 mg. of methylcellulose. There were 15 plots of 15 plants each, each of the 4 treatments being given on 3 plots, the other plots acting as controls. The plants were about 45 cm. high and had about 12 leaves 20 days after transplanting at the time of treatment; the second treatments with (1) and (2) being made 15 days later. Gaps and irregular growth occurred in treatments (3) and (4) and the statistical analysis of results was therefore confined to (1) and (2). The treated plants produced significantly longer leaves but no increase in number of leaves. The leaves of the treated plants were narrow and had irregular margins. These results do not suggest any practical advantage accruing from the use of GA.

3756. SALMON, R. C.
Suckering with oil emulsions.
Rhod. Tobacco, 1959, No. 18, p. 8, illus.

Refined mineral oils used for desuckering tobacco gave almost the same increase in yield and the same quality of leaf as removal by hand. Dry weather is required to prevent the oil being washed off the suckers.

Physiology and biochemistry.

(*See also* 3156, 3162, 3754, 3791b, c, i, k, l, m-o, t, w.)

3757. POLJAKOV, I. M.
Using labelled pollen in studies of fertilization problems. [Russian.]
Selekcija i Semenovodstvo, 1957, No. 3, pp. 14-22, from *CORESTA Inf. Bull.*, 1958, No. 2, Abstr. 1,370, and *Ref. Ž.* (*Biol.*), 1958, No. 8, Abstr. 34,215.

The fertilization process has been studied in various plants by making an additional pollination with pollen from another variety labelled with P^{32} or S^{35}, 6, 12 or 24 hours after the normal pollination. Considerable amounts of radioactive elements can be found in the seeds, indicating that they must have passed through the placenta by diffusion after being metabolized. An account is given of the chemistry of the seed and pollen constituents which carried the labelled elements in *N. rustica* and of the distribution of S^{35} in the style and ovary of *N. tabacum* during 12–74 hours after pollination.

3758. LANDOLT, A. M.
Respiratorischer Quotient von Tabakblättern. **(Respiratory quotient of tobacco leaves.)**
Experientia, 1958, **14**: 93-4, from *Tob. Abstr.*, 1958, **2**: 304-5.

The RQ of leaves of the variety Paesana was found to be 1·22 in air and 1·00 in pure oxygen when kept in darkness for 6 hours after picking. A high RQ is believed to be associated with the failure to permit O_2 to diffuse inside the leaf, so that a partial O_2 pressure is retained which makes aerobic carbohydrate oxidation possible.

3759. WITTMER, G.
Prime osservazioni sull'attività citologica dell'olio estratto da semi di *N. tabacum* e *N. rustica*. **(First observations on the cytological activity of oil extracted from seeds of *Nicotiana tabacum* and *N. rustica*.)** [English summary 1 p.]
Tabacco, 1958, **62**: 384-405, bibl. 50, illus.

The first part of the experiments described indicated the feasibility of using onion root tips in cytological tests for liposoluble substances. Onion root tips were then used in tests involving old and fresh seeds of *N. tabacum* and *N. rustica*. All the seed oils were physiologically active and eventually lethal to chromosomes, the toxicity depending on age, method of extraction and species. Thus oil from fresh seeds was much more active than that from old seeds, cold-extracted oil was more potent in its effects than warm-extracted oil, and oil from *N. rustica* was more potent than that from *N. tabacum*. Actual mutagenic activity or chromosome breaking was only observed following the use of old seed of *N. rustica*. Chromosome aberrations consisted of metaphasis and anaphasis with free chromosome fragmentation. Although the frequency of aberration was small, the type of break shows the potential existence of a capacity for altering chromosome structure.

3760. Pierpoint, W. S.

Mitochondrial preparations from the leaves of tobacco (*Nicotiana tabacum*).

Biochem. J., 1959, **71**: 518-28, bibl. 45, illus.

An extract containing succinoxidase was obtained by grinding leaves from young tobacco plants in a complex mixture of mineral and organic solutes, and centrifuging. This extract oxidized most of the acids of the tricarboxylic acid cycle.—Rothamsted exp. Stat.

3761. Vickery, H. B.

The metabolism of the organic acids of tobacco leaves. XVI. Effect of culture of excised leaves in solutions of malonate.

J. biol. Chem., 1959, **234**: 1363-8, bibl. 20.

An experiment reported earlier [*H.A.*, 27: 3638] has been repeated, but with a 0·2 M concentration of potassium malonate in place of a 0·1 M concentration. Excised tobacco leaves cultured in the malonate solution at pH 5 and 6 accumulated malonic acid in 48 hours to reach a final concentration exceeding 0·1 M. Under these conditions the extent to which malic acid was metabolized was about 3 times that observed in control leaves cultured in water. Succinic acid was a major product, but for the first 24 hours citric acid remained unchanged in quantity in the leaves cultured at pH 5 and increased only slightly in those at pH 6. During the second 24 hours there was a small increase of citric acid in the leaves cultured at pH 5, and in those cultured at pH 6 it increased to about the same extent as in the control leaves. A small part of the acquired malonic acid became involved in the metabolic processes towards the end of the culture period and probably contributed to the formation of citric acid. These results do not conform well with the requirements of a general metabolic scheme analogous to the tricarboxylic acid cycle. [From authors' summary. For part XV see *H.A.*, 29: 1577.]—Conn. agric. Exp. Stat., New Haven.

3762. Griffith, T., and Byerrum, R. U.

Biosynthesis of glycolate and related compounds from ribose-1-C^{14} in tobacco leaves.

J. biol. Chem., 1959, **234**: 762-4, bibl. 24.

The vacuum infiltration of detached leaves of *Nicotiana rustica* with D-ribose-1-C^{14} resulted in the synthesis of radioactive glycolic acid, glycine, serine and alanine. The total amount of C^{14} incorporated into three compounds was increased by illuminating the leaves, but the distribution of C^{14} within the compounds was similar whether metabolism occurred in light or darkness. The pattern of labelling indicated that carbon atoms 1 and 2 of a pentose gave rise to glycolate, which was then converted to glycine and serine. It was previously shown that these compounds contribute to the 1-carbon pool in plant metabolism and, in the case of tobacco, are efficient precursors of the methyl group of nicotine and lignin. The present results establish a pathway by which these methyl groups can be synthesized from photosynthetic CO_2.—Mich. St. Univ., E. Lansing.

3763. Aksu, S., and Enercan, S.

Türk tütünlerinin kimyasal birleşim karekterleri. **(The chemical composition characters of Turkish tobaccos.)** [English summary 1 p.]

İnhis. Enst. Raporl., 1958, **7**: 185-201, bibl. 9.

Analyses of samples drawn from the 3 regions of tobacco production in Turkey between 1950 and 1957 showed 60% to have less than 1% nicotine, 36% between 1 and 2%, and only 4% over 2%.

3764. Jeffrey, R. N.

Buildup and conversion of alkaloids within the tobacco leaf.

From abstr. in *Cigar Manuf. Ass. Res. Seminar*, Washington, D.C., 1958, from *Tob. Abstr.*, 1959, **3**: 69-70.

The nicotine and nornicotine contents of Robinson Maryland tobacco were determined at 18 different positions per leaf at 4 different leaf heights per plant at 9 weekly intervals during the growing season and at 5 times in the air curing barn. The alkaloid content was highly variable between different positions within the leaf at any one time, but in general increased from base to tip and from midrib to margin. It did not increase from mid-season onwards in the basal leaves but did increase in the upper leaves, especially after topping. The conversion of nicotine to nornicotine started at the tip of the lowest leaf and moved along the margins and in towards the midrib and base in the same progression as field yellowing, taking 2 months to reach the base. It started later at higher leaf levels but moved forward more rapidly during yellowing in the curing barn. This permitted development of a screening test usable before flowering for the potential occurrence of this fault. This makes breeding for its elimination much easier and quicker.

3765. (Burk, L. G., and Jeffrey, R. N.)

Two steps toward better tobacco.

Agric. Res. Wash., 1959, 7(9): 10.

The ability to convert nicotine to nornicotine was shown to be due to a single dominant gene. When conversion occurs the leaf turns yellow, and reliable alkaloid tests, using paper chromatography, may be made on the bottom leaves that yellow while the seedling is small, instead of waiting until the mature leaves yellow after flowering.—Agric. Res. Center, Beltsville.

3766. Cuzin, J.
Influence des facteurs externes sur le contenu en principes actifs des tabacs industriels. **(Effect of external factors on levels of active principals in industrial tobaccos.)**
Über Arznei- und Nutzpflanzenkultur, Arbeitstag, Wageningen, 1957, pp. 24-30, from *CORESTA Inf. Bull.*, 1958, No. 3, Abstr. 1,668.

Heavy applications of mineral N (chiefly nitric N) encourage high levels of alkaloids; P had no effect; K, at high doses, may inhibit nicotine accumulation; other cations may affect nicotine evolution in dry tobacco, inasmuch as they control redox potentials. Under constant illumination and temperature, water may have a slight positive action; at constant temperature and humidity, nicotine level is correlated with duration of exposure to sunlight rather than with intensity. Nicotine level is lower as plants are more densely crowded; topping and suckering increase nicotine contents by 2 to 4%. Late topping has scarcely any effect (*N. rustica* var. Bakoum Nigra being an exception). Regulating external factors may control alkaloids levels to the extent of 10 to 50%.

3767. Clagett, C. O., Brown, M. S., and Engle, H. B.
Greenhouse and field trials of the effect of gibberellic acid on nicotine content of Pennsylvania seedleaf tobacco.
Pap. 12th Conf. Tob. Chem. Res., Durham, N.C., 1958, No. 21, from *Tob. Abstr.*, 1958, **2**: 591.

In field studies there was no appreciable difference in nicotine content at harvest time as a result of gibberellic acid application in the seedbed or after transplanting. In greenhouse studies the application of GA nearer the time of harvest caused a 15 to 63% reduction of nicotine. Field studies of the effects of late application on the rate of nicotine decrease in the mature plant are also reported.

3768. Parups, E. V.
Influence of gibberellic acid on the breakdown of nicotine in tobacco.
Canad. J. Bot., 1959, **37**: 523-5, bibl. 7.

Detached leaves, leaf disks, and sterile, detached roots of tobacco were sprayed, vacuum-infiltrated, incubated, or treated with GA to test the influence of this chemical on the breakdown of nicotine. No statistically significant difference in nicotine content were observed due to these treatments. [Author's abstract.] This result supports the view that the decline in nicotine content following applications of GA [*H.A.*, 29: 2633] is due to changes in the metabolic processes leading to nicotine formation and not to an increased breakdown of the alkaloid.—Canada Dep. Agric., Ottawa.

3769. Marion, L.
La biogénèse des alcaloïdes. **(Alkaloid biogenesis.)**
Bull. Soc. Chim. Fr., 1958, **1**: 109-15, from *CORESTA Inf. Bull.*, 1958, No. 2, Abstr. 1,322.

The biogenesis of hordenine, gramine, hyoscyamine, nicotine, stachydrine, damascenine and trigonelline, as well as those of the methoxy- and methylenedioxy- groups were studied with the aid of amino-acids labelled with C^{14}. It was shown that the methyl group linked to nicotine N comes from methionine or from choline by transmethylization; it may also come from the glycine, serine, formaldehyde and glycolate of Ca. The pyrrolidine ring of nicotine has ornithine as a precursor. Lysine is the precursor of the piperidine ring in anabasine, but its pyridine ring has a different origin. Even though the experimental study of alkaloid biogenesis is only starting, it already seems to confirm the hypothesis that plant alkaloids come either from amino acids or from substances readily derived from amino acids by processes influenced by enzymes; when one carbon is lacking, it is supplied by formaldehyde or by a substance which can produce formaldehyde. Finally, the rôle of enzyme catalysts in alkaloid biogenesis is discussed.

3770. Vecsey, T., and Bartha, L.
Details of nicotine biosynthesis. [Hungarian.]
Annu. agric. Sch. Debrecen, 1957, pp. 99-122, from *Tob. Abstr.*, 1959, **3**: 117.

Nicotine formation in germinating tobacco seeds was studied for the first 10 days of growth. The use of Knop's solution or of distilled water did not affect nicotine synthesis, which occurred at the expense of stored proteins. Nicotine was determined as early as 24 hours after germination. Proline, glycine and ornithine were found in the seed protein hydrolyzate, but histidine, cystine and tryptophane were not found. An unidentified free amino acid was also determined.

3771. Griffith, T., and Byerrum, R. U.
Biogenesis of nicotine.
Science, 1959, **129**: 1485-6, bibl. 12.

Radioactive nicotine was synthesized by *Nicotiana rustica* L., which was fed sodium acetate-1-C^{14}, sodium acetate-2-C^{14}, sodium pyruvate-1-C^{14}, or sodium pyruvate-3-C^{14}. Acetate-2-C^{14} and pyruvate-3-C^{14} were converted to nicotine with the least dilution of radioisotope, whereas pyruvate-1-C^{14} was incorporated with a relatively large dilution. When acetate-1-C^{14} was administered to the plants the nicotine contained C^{14} only in the pyrrolidine ring. After acetate-2-C^{14} was fed, C^{14} was located in both the pyrrolidine and pyridine rings. [Authors' abstract.]—Mich. St. Univ., E. Lansing.

3772. JEAN, J., AND REID, W. W.
The chlorogenic acids of tobacco.
Chem. Ind. Lond., 1959, No. 21, pp. 655-6, bibl. 3.

Chlorogenic acid isolated from flue-cured tobacco was divided into fractions. Of these one was chlorogenic acid itself and another neo-chlorogenic acid. Two others were re-arranged forms of chlorogenic acid, having identical colour reactions and ultraviolet absorption spectra but different RF values. The same 4 components were found in the fresh leaves of plants fed with labelled precursors of chlorogenic acid.—Res. Dep., Carreras Ltd., London.

3773. ZUCKER, M.
Biochemistry of chlorogenic acid in tobacco.
From abstr. in *Cigar Manuf. Ass. Res. Seminar*, Washington, D.C., 1958, from *Tob. Abstr.*, 1959, **3**: 115.

Chlorogenic acid is the major phenol in the tobacco leaf and its oxidation by polyphenol oxidase or peroxidase is in large part responsible for the formation of the brown colour of the cured leaf. The oxidation of chlorogenic acid by polyphenol oxidase may also involve a number of other leaf components that are not substrates for the enzymes themselves. These include amino acids, nornicotine, other phenols, and pyrroles. Consequently, oxidation of chlorogenic acid during curing can produce major changes in the composition of the leaf. Chlorogenic acid has been implicated as a respiratory pigment in green leaves and as an inhibitor of indoleacetic acid oxidase and oxidative phosphorylation.

Disorders, diseases and pests.

(*See also* 3475, 3731, 3736, 3791a, e, q, r, u, 4148.)

3774. MACDOWALL, F. D. H.
Ozone as a cause of weather fleck.
Lighter, 1959, **29**(1): 1.

In experiments at Ottawa synthetically produced ozone has injured tobacco leaves in a manner resembling weather flecking. A delay of at least 12 hours occurs between treatment and the appearance of symptoms. Ozone damage only occurs when the stomata are open, and thus is closely influenced by water relations.

3775. TAYLOR, G. S.
A possible cause of tobacco fleck.
Abstr. in *Phytopathology*, 1959, **49**: 229.

The sporadic, overnight collapse of palisade cells in maturing leaves of certain shade-grown tobacco varieties produces irregular brown or white spots called "weather fleck". Fleck is worse in direct sunlight and along open rows, field edges, and the southwest sides of plants and fields. It does not appear under overlapping leaves or on tissues distal to a cut midrib. It is reduced by mist-blown sprays containing either 0·71% maneb or 0·17% dichlone plus 0·73% cottonseed oil, and by 16·5% zineb dust. Fleck usually appears in the field after the intercellular leaf spaces have been flooded by rain, fog or heavy dew. The cellular pattern of water congestion in the field often exactly matches the fleck pattern that subsequently develops. Water congestion alone, however, does not cause fleck. Symptoms identical to fleck can be induced by gassing leaves with SO_2. Evidently, direct sunlight predisposes tissues to threshold damage by air-borne toxicants. Weather-produced flooding of such tissues causes death of the palisade cells, possibly by asphyxiation.

3776. BADAMI, R. S.
Some effects of changing temperature and of virus inhibitors on infection by cucumber mosaic virus.
Ann. appl. Biol., 1959, **47**: 78-89, bibl. 20.

The spinach strain of this virus did not multiply or produce symptoms on tobacco plants above 30° C. and was rapidly inactivated at 28° C., but the yellow strain produced more lesions at 36° C. than at 20° C. Both strains were strongly inhibited by pancreatic ribonuclease and azaguanine, but only slightly by thiouracil. Floating inoculated leaves in nutrient solution increased the development of the virus.—Rothamsted exp. Stat.

3777. FRANCKI, R. I. B., AND MATTHEWS, R. E. F.
Effect of 2-thiouracil on the infectivity of tobacco mosaic virus.
Biochim. biophys. Acta, 1959, **34**: 570-1, bibl. 9.

When excised tobacco leaves that had been inoculated with TMV were cultured in a solution containing 2-thiouracil some 56–80% of the virus particles were apparently rendered non-infectious. With partially purified virus the reduction in infectivity by thiouracil was only about 37%; reasons which might account for this smaller response are discussed.—D.S.I.R., Univ. Auckland, N.Z.

3778. SHEPHERD, R. J.
The influence of boron and magnesium nutrition of *Nicotiana tabacum* L. on the multiplication of tobacco mosaic virus.
Diss. Abstr., 1959, **19**: 3102, being *L.C. Card No. Mic.* 59-1182 of 57 pp.

Studies with tobacco plants grown at various B levels indicated that B is not involved in the multiplication of mosaic virus, except in so far as it promotes more vigorous growth in the host plant. Magnesium deficiency, however, limited virus multiplication in tobacco.—Univ. Wis.

3779. ULRYCHOVÁ-ZELINKOVÁ, M.
Cadmium ions as inhibitors of tobacco mosaic virus. [Czech and Russian summaries ⅓ p. each.]
Biol. Plant., Prague, 1959, **1**: 135-41, bibl. 22, illus.

Cadmium supplied in two waterings totalling 160 mg. Cd per plant, applied just before inoculation and on the 3rd day after inoculation, reduced virus infection by 70%, without injury to the tobacco plants. The inhibitory effect of Cd ions was considerably reduced when the solution was applied 24 hours before inoculation. There were indications that Cd ions cause a disturbance of P metabolism.—Inst. Biol., Prague.

3780. Legge, J. B. B.
Seasonal pattern and control of rosette.
Rhod. Tobacco, 1959, No. 18, pp. 19-21, illus.

Plantings made in December, January and February should be sprayed with 1 lb. malathion 25% w.p. in 40 gal. water weekly for 4 weeks to control aphids which spread rosette disease. The main problem of control is to keep the plants free of infection in the seed bed and for the first 5 weeks after they are planted out.

3781. Hidaka, Z., and Murano, H.
Studies on the streptomycin in the plant body and control of bacterial diseases by surface absorption. [Japanese, with English summary.)
Ann. phytopath. Soc., Japan, 1956, **21**(2-3): 49-52, from *Tob. Abstr.*, 1958, **2**: 267.

Complete control of *Pseudomonas tabacum* on tobacco for ten days after inoculation resulted from one streptomycin spray containing 110 mg./ml. With *P. solanacearum* a second spray was required five days after inoculation. Streptomycin was detected in fully developed tobacco leaves five weeks after application and was translocated in the phloem and pith but not in the xylem.

3782. Rosa, M.
Sperimentazione di alcuni prodotti per la lotta chimica contro i funghi fitopatogeni viventi nel terreno. **(Trials with certain products for chemical control of soil pathogenic fungi.)** [English summary ½ p.]
Boll. Staz. Pat. veg. Roma, 1958 (issued 1959), **16**: 87-101, bibl. 18.

Nine products were applied to the soil of an infected tobacco seed bed on dates varying from 1 to 14 days before sowing. Nearly 30 days after the tobacco seed had been sown seedlings infected with *Pythium* were found only in the control plots and those treated with WL-1391 (a test product), Cryptonol (98% oxyquinoline sulphate), Orthocide 50 (50% captan) and Dithex (65% zineb). Moreover, the application of Vapam + allyl alcohol, Bedrench (81% allyl alcohol + 11·5% ethylene dibromide), Crag Mylone (85% dimethyltetrahydrothiadiazine thione) and Vapam alone resulted, in comparison with the other substances, in a great and significant diminution in infection by *Fusarium* sp. and *Rhizoctonia* sp. and in the production of better grown seedlings. These 4 substances also prevented the emergence of weeds, which appeared in plots treated by the other substances and in the controls.

3783. Cole, J. S.
Is there a relationship between fertilizer and *Alternaria?*
Rhod. Tobacco, 1959, No. 18, pp. 18-19, illus.

In trials over 3 seasons N has been found to increase the incidence of *Alternaria*, and K and P to decrease it. The disease was also more prevalent in crops with potash deficiency symptoms.

3784. Gooding, G. V., and Lucas, G. B.
Effect of inoculum level on the severity of tobacco black shank.
Phytopathology, 1959, **49**: 274-6, bibl. 12, illus.

Tobacco varieties representing various levels of black-shank resistance were inoculated with different concentrations of zoospores of *Phytophthora parasitica* var. *nicotianae* in greenhouse tests. Rapidity of disease development was directly related to number of spores used. It required more spores to kill resistant plants than susceptible plants in a given time. Environmental factors that affected the succulence of the plants also affected the disease indices. [Authors' summary.] —N.C. St. Coll., Raleigh.

3785. Holdeman, Q. L.
Fungicides for tobacco blue mold control.
Mimeo. Ser. S.C. agric. Exp. Stat. Bot. Bact. Dep. **6**, 1958, pp. 9, from *Tob. Abstr.*, 1958, **2**: 394.

Zineb at 3 lb. of 65% concentrate per 100 gal. or at 6·5% in a dust gave adequate control of blue mould and caused no plant injury. Ferbam at 4 lb. of a 76% concentrate per 100 gal. or at 11·4% as a dust was equally safe, and only slightly less effective than zineb. With both fungicides the spray was considerably more effective than the dust. Maneb also gave adequate control of blue mould but is apt to be phytotoxic. Streptomycin sulphate gave adequate control when used twice each week at a concentration of 200 p.p.m. but did not show residual control equal to that of zineb.

3786. Nusbaum, C. J.
Good management—key to root knot control.
Res. and Fmg N.C., 1959, **17**(3): 12, illus.

In trials carried out at the Tobacco Research Station, Oxford, N.C., since 1954 the best root-knot nematode control and also the largest increases in the value of the tobacco crop followed fumigation with EDB and DD. However, several off-season cultural practices also proved useful in reducing nematode populations and in increasing the values of subsequent tobacco crops. These included ploughing out the tobacco roots, cutting the stalks and disking, and growing and ploughing in an oat green manure crop.

Harvesting, curing and fermentation.

(*See also* 3791d, l, 4162q.)

3787. Nichols, B. C., and McMurtrey, J. E., Jr.
Priming tests with burley tobacco.
Bull. Tenn. agric. Exp. Stat. **285**, 1958, pp. 14, from *Tob. Abstr.*, 1959, **3**: 9.

Compared with stalk cutting, one priming increased yield and value per acre and also, but to a lesser extent, quality. More than one priming is not recommended.

3788. Dimitrov, L., and Galev, I.
The principles of tobacco curing and curing installations. [Bulgarian.]
Bŭlgar Tjutjun, 1958, **3**: 263-88, illus., from *Tob. Abstr.*, 1958, **2**: 578.

Studies on air-curing strung tobacco showed that, for each temperature rise of 10° C., the water evaporation rate increased about 2½ times. The speed of the curing process was influenced less by RH than by temperature changes. Rate of water evaporation depended largely on the intensity of sunlight, and the leaves dried fastest with their smooth surface towards the sun and when protected from horizontal air circulation. Sun-cured tobacco needed subsequent room drying at 40° C. to ensure even quality, but this two-stage form of curing was more economical than carrying out the whole process in barns.

3789. Djadjučenko, P. M.
Drying and fermenting mahorka by the use of forced ventilation. [Russian.]
Tabak, 1959, **20**(1): 51-2, illus.

A brief description is given of a combined method of drying and fermentation. Mahorka leaves of 50–60% moisture content were placed in stacks 4 m. long, 3 m. wide and 1·3 m. deep on slats in the barns, and left to heat to 40° C., after which air was forced through to cause rapid initial cooling (1° C./min.) for 2 hours. The stacks were then allowed to warm up again to 30° C., cooled down again, and the process was repeated. After the third ventilation, lasting 8 hours, the temperature remained at 8·5° C., i.e. that of the surrounding environment, indicating that fermentation had ended. The end product was of 1st class quality with a moisture content of 32%. When carried out in September the process lasted 14-days, but earlier in the season during warmer weather it would be speeded up. (An editorial note emphasizes the preliminary nature of this work.)

3790. Gorban', K. A., and Il'ina, L. A.
The first trial of tobacco fermentation by the combined regime at the Soči fermentation plant. [Russian.]
Tabak, 1959, **20**(1): 49-50.

Very good results were obtained when bales of the tobacco variety Samsun III were fermented by a method similar to that described earlier [see *H.A.*, 29: 2650]. The process lasted 11½ days and gave tobacco of a bright, even colour, good aroma and elasticity. The average loss through fermentation was 8·2%.

Noted.

3791.

a Bode, O., Carstens, H., and Seehofer, F.
Über die Virusresistenz des Virgin SCR. **(The virus resistance of Virgin SCR.)**
Dtsch. Tabakb., 1959, **39**(7): 53-4, bibl. 5, from *Abstract Card Inst. Tabakforsch., Dresden*, No. 59/217.
Virgin SCR much less susceptible to Y-virus than the similar variety VN 1.

b Duranton, J., Galmiche, J. M., and Roux, E.
Métabolisme des pigments chlorophylliens chez le tabac. **(Metabolism of chlorophyll pigments in tobacco.)**
C.R. Acad. Sci. Paris, 1958, **246**: 992-5, from *Tob. Abstr.*, 1958, **2**: 302-3, and *CORESTA Inf. Bull.*, 1958, No. 3, Abstr. 1,665.
Tracer experiments on the role of d-aminolevulinic acid as precursor.

c Dymicky, M., and Stedman, R. L.
Composition studies on tobacco. VII. Isoeugenol, hydrocarbons and probable bound stigmasterol from flue-cured leaves.
Tobacco, N.Y., 1959, **148**(18): 22-3, bibl. 9.
Results of partial fractionation of an alcoholic extract. [For part VI see 3791t.]

d Giovannozzi, M.
La fermentazione dei tabacchi. **(Tobacco fermentation.)**
Tabacco, 1958, **62**: 311-62, bibl. 166.
An up-to-date review.

e (Heggestad, H. E., and Middleton, J. T.)
Ozone causes tobacco fleck.
Agric. Res. Wash., 1959, **7**(9): 8-9, illus.
See *H.A.*, 29: 1568.

f Henderson, R. G.
Performance of tobacco varieties and breeding lines tested in Virginia in 1957.
Res. Rep. Va agric. Exp. Stat. Plant Path. Physiol. Dep. **14**, 1959, pp. 28.
Mainly tabulated data with some maps.

g Henderson, R. G., Sears, R. D., and Spasoff, L.
Virginia 312, a new dark, fire-cured variety of tobacco resistant to mosaic and root rot.
From abstr. in *Va J. Sci.*, 1957, **8**: 267, from *Tob. Abstr.*, 1958, **2**: 436.
High yielding but somewhat brittle and subject to storm damage.

h ISHITOYA, K., AND KOMATSU, N.
Effects of phosphate applications on the yield and the quality of bright leaf tobacco. I to VII.
Bull. Okayama Tob. Exp. Stat., No. 7, pp. 1, 8, 15, 17, 22, 26 and 30 from *Abstr. Res. Japan Monop. Corp., Tokyo*, 1958, No. 1, Abstrs 0080-0086.
Soil and water culture studies.

i MIKHAILOV, M. K.
Methode zur Bestimmung der Flavonoide im Tabak. **(A method of flavonoid determination in tobacco.)** [Russian summary 7 lines.]
C.R. Acad. bulg. Sci., 1958, **11**: 493-6, bibl. 13.
A colorimetric method with an accuracy of ±5% [see also *H.A.*, 29: 2635].

j MOORE, E. L., JONES, G. L., AND POWELL, N. T.
NC 73, new tobacco variety.
Res. and Fmg N.C., 1959, **17**(3): 3, illus.
The good and weak points enumerated of this black-shank-resistant, flue-cured variety.

k NAGASAWA, M., AND TAGUCHI, T.
Shikimic acid in the tobacco leaf. [Japanese.]
Sci. Paps Japan Monop. Corp. cent. Res. Inst., 1958, No. 99, pp. 8-9, from *CORESTA Inf. Bull.*, 1958, No. 3, Abstr. 1,606.
Content was 0·02% of dry matter.

l NAGASAWA, M., AND TAGUCHI, T.
Chlorogenic acid in the tobacco leaf during flue-curing. [Japanese.]
Sci. Paps Japan Monop. Corp. cent. Res. Inst., 1958, No. 99, pp. 4-7, from *Tob. Abstr.*, 1958, **2**: 383.
Chlorogenic acid increased from 0·34% in the fresh leaf to 3·06% in the cured.

m NANGNIOT, P., AND MELAMED, N.
Détermination polarographique de la nicotine dans les tabacs de culture. **(Polarographic determination of nicotine in cultivated tobacco.)**
Chim. anal., 1958, **40**: 3-7, from *CORESTA Inf. Bull.*, 1958, No. 3, Abstr. 1,603.
And of nornicotine by difference from total alkaloids [see also *H.A.*, 29: 2651m].

n ONISHI, I., AND OTHERS.
Studies on the essential oils of tobacco leaves. Parts 1 to 17. [Japanese.]
Sci. Paps Japan Monop. Corp. cent. Res. Inst., 1954 to 1958, Nos. 90-99, and *Bull. agric. chem. Soc. Japan*, 1955 to 1958, Nos. 19-22, from *Abstr. Res. Japan Monop. Corp., Tokyo*, 1958, No. 1, and *CORESTA Inf. Bull.*, 1958, Nos. 2 and 3.
Both abstract journals contain a series of fairly detailed abstracts.

o PENN, P. T.
A study of the polyphenols and polyphenol oxidase present in tobacco leaves.
Diss. Abstr., 1959, **19**: 2729, being *L.C. Card No. Mic.* 59-344 of 105 pp.
See *H.A.*, 28: 3827 and 29: 621.

p PINEAU, N.
La culture du tabac sous toile. **(Tobacco growing under cloth shade.)**
Bull. Engrais, 1959, No. 415, pp. 27-8, from *Trop. Abstr.*, 1959, **14**, Abstr. g1950.
Promising results using Italian cultural methods in France for cigar wrapper production.

q POWELL, N. T.
The nature of the black shank – root-knot disease complex in flue-cured tobacco and its control by breeding for resistance to both pathogens.
Diss. Abstr., 1959, **19**: 2709-10, being *L.C. Card No. Mic.* 59-348 of 94 pp.
See *H.A.*, 29: 612.

r RAPPAPORT, I., AND WILDMAN, S. G.
The distribution on *Nicotiana glutinosa* leaves of lesions produced by tobacco mosaic virus.
Phytopathology, 1959, **49**: 231.
Different parts of a leaf differed in sensitivity to infection.

s RIETSEMA, J.
Some novel experiments with tobacco culture in Puerto Rico.
From abstr. in *Cigar Manuf. Ass. Res. Seminar*, Washington, D.C., 1958, from *Tob. Abstr.*, 1959, **3**: 78.
Year-round production of cigar wrapper in gravel beds by hydroponics.

t STEDMAN, R. L., AND DYMICKY, M.
Composition studies on tobacco. VI. Phthalates from flue-cured leaves.
Tobacco, N.Y., 1959, **148**(17): 196-8, bibl. 10.
For Part V see *H.A.*, 29: 2651z.

u TAKAOKA, I., AND NAKAZAWA, K.
Studies on insects attacking stored tobacco and tobacco products. [English summaries, tables and legends to illustrations and diagrams.]
Bull. Hatano Tob. Exp. Stat., 1956, No. 41, pp. 1-94, bibls, illus.
Eight papers dealing mainly with *Ephestia elutella* and *Lasioderma serricorne*.

v U.S. Department of Agriculture, Agricultural Marketing Service.
Annual report on tobacco statistics, 1958.
Statist. Bull. U.S. Dep. Agric. **247**, 1959, pp. 72.
Tabulated data on all aspects of production and trade in the U.S.

w Wright, H. E., Jr., Burton, W. W., and Berry, R. C., Jr.
Carotenoids and related colorless polyenes of aged burley tobacco.
Arch. Biochem. Biophys., 1959, **82**: 107-16, bibl. 27.
18 carotenoid pigments and 5 colourless polyenes separated chromatographically and compared with constituents of green leaf.

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS.

Condiment and spice plants.

(*See also* 3845h, n.)

3792. Khan, K. F.
Ensure two-fold ginger yields.
Indian Fmg, 1959, **8**(12): 10-11, illus.
Yields can often be doubled by early planting and applying a leaf mulch. Recommended varieties are Burdwan and Ernad from W. Bengal and Kerala respectively.—Ginger Res. Scheme, Wyanad.

3793. Kokkonen, K.
Meirami—mainio maustekasvi. **(Marjoram—an excellent herb.)**
Puutarha, 1959, **62**: 206-7, illus.
In Finland both yield and quality were higher from sowing marjoram in hotbeds on 10 April than on 26 April, and both sowings gave better results than one made in the open on 23 May.

3794. Anon.
Sample survey on pepper crop in Kerala.
Statist. News Lett., 1958, **8**(1): 5.
The survey elicited the following information: the average yield of dry black pepper was 21·5 oz. per stool; *Erythrina indica* was the most common support, other popular support trees are named; Kaniakadan was the most popular of several named varieties; half the plots were manured and yielded 8·6 oz. per stool more than unmanured plots; soil conservation measures were in general practice, but nearly half of the plots were affected by diseases and pests which reduced yields.

3795. Dwarakanath, C. T., Rao, T. N. R., and Jowar, D. S.
Chemical analysis of some varieties of Indian pepper (*Piper nigrum* L.).
Food Sci., Mysore, 1958, **7**: 285-7, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-285-6.
Figures are given for the contents of moisture, total N, protein N, volatile and non-volatile ether extracts, alcohol extract, crude fibre, total ash, water-soluble and acid-insoluble ash, starch, etc., in 11 varieties of pepper grown in India. The standard values of not less than 6% of ether-soluble extract or 8% of absolute-alcohol extract were attained by 9 varieties, and no varieties exceeded the standard values of 7% of total ash or 1·5% of ash insoluble in HCl.

Drug plants.

(*See also* 3117, 3545, 3838, 3845c, g, i, p, v, y, z.)

3796. Swanholm, C. E., St. John, H., and Scheuer, P. J.
A survey of alkaloids in Hawaiian plants. I.
Pacific Sci., 1959, **13**: 295-305, bibl. 11.
Preliminary investigations concerning the presence of alkaloids in 96 species of Hawaiian plants, representing 77 genera and 49 families, indicated that 30 species contained alkaloids. Thirty-two species gave negative tests, while the remainder were listed as doubtful. The testing procedure consisted of extracting various plant parts with hydrochloric acid and testing the extract separately with 6 test reagents. The acid extraction was supplemented in some cases by an ammonia-mixed organic solvent solution. The precipitates were graded visually on a trace, light, or heavy basis. Only those species which gave a light and/or heavy precipitate with all 6 test reagents were classified as containing alkaloids. Among the 30 species, which gave positive tests for alkaloids, 9 genera were represented, for which no previous alkaloid information exists. These 9 genera, 5 of which are endemic to the Hawaiian Islands, should afford fruitful sources for future studies for alkaloids.

3797. Browińska-Szmalowa, Z.
Występowanie alkaloidów w kiełkujących nasionach niektórych roślin psiankowatych. **(The formation of alkaloids in germinating seeds of certain solanaceous plants.)** [Russian and German summaries.]
Biul. Inst. Rośl. leczn., 1957, **3**(1): 52-9, from *Ref. Ž.* (*Biol.*), 1958, No. 7, Abstr. 30,113.
In dormant seeds of *Atropa belladonna*, *Hyoscyamus niger* var. *annuus*, *Datura stramonium* and *D. innoxia* alkaloids were localized in the seed coats. Following soaking alkaloids were found first in the endosperm, then in the embryo. They appeared in places of intensive cell division, disappearing when this activity ceased. The author suggests a possible rôle for them as stimulators of plant development. It was established that their presence in the embryos

of soaked seeds was indicative of ability to germinate.

3798. Brejcha, V., Neubauer, Š., and Starý, F.
Zkušenosti s ochranou některých léčivých rostlin. (**Trials with plant protectants for some medicinal plants.**) [English summary ½ p.]
Preslia, 1959, **31**: 331-2.

Aphis fabae on camomile was successfully controlled by 2 sprays of Fosfothion (0·2%), starting about 2 to 3 weeks before harvest. Methyl bromide (3 kg./100 m³) was a satisfactory fumigant for *Ephestia elutella* in dried camomile; Pybuthrine (piperonyl butoxide with pyrethrins) applied as an aerosol gave fairly good control of *Ephestia* without herb contamination. Rust infection (*Puccinia menthae* and *P. malvacearum*) on peppermint, *Hibiscus* and *Malva* was not reduced by sprays of TMTD, ferric sulphate or ferrous sulphate. Rust was not troublesome on a resistant variety of peppermint, and on *Hibiscus* and *Malva* early harvesting helped to reduce it. Rust has not appeared on peppermint plants already infected with mosaic virus. Kuprikol (1%) and Sulikol (1%) sprays controlled *Phytophthora infestans* on *Solanum aviculare*.—Res. Inst. medicin. Herbs, Prague.

3799. Leete, E.
Biogenesis of mescaline.
Chem. Ind. Lond., 1959, No. 19, p. 604, bibl. 2.

The hallucinogenic alkaloid mescaline is derived from the peyote cactus, *Anhalonium lewinii* (syn. *Lophophora williamsii*). Tyrosine labelled with C^{14} was administered in two ways to a plant growing in gravel. Subsequent investigation indicated that essentially all the specific activity of the mescaline was located on the α-carbon atom and suggested that tyrosine is a direct precursor of mescaline.—Univ. Minnesota, Minneapolis.

3800. Albors Yoldi, E.
Contribución al estudio y producción de alcaloides en el género *Atropa*. (**Contribution to the study and production of alkaloids in the genus *Atropa*.**) [English and German summaries ½ p. each.]
Farmacognosia, 1958, **18**: 295-401, bibl. 213, illus.

In breeding experiments with *Atropa* spp., a triple hybrid with a 1% alkaloid content was produced by crossing *A. boetica* with the existing hybrid *A. belladonna* × *A. lutea*. The progeny of the new form varied in alkaloid content, some reaching 1·6%. Alkaloid production was highest during fruiting (July and August). The hybrid characters could not be perpetuated by seed, but were very successfully maintained by propagation from root cuttings. Production in most types begins to decline after the third year in irrigated, and after the fourth year in non-irrigated, plants. The determination of alkaloids by improved methods is described.

3801. Deltchev, G.
L'influence de la densité des ensemencements sur le rendement et le mouvement de dépots d'alcaloïdes sur les feuilles de belladone. (**The effect of sowing density on yield and alkaloid content in belladonna leaves.**) [Russian summary ¼ p.]
C.R. Acad. bulg. Sci., 1959, **12**: 73-6.

Belladonna thinned to 30 cm. in the row produced bigger plants, and the leaves contained about 5·55% more alkaloids during the generative growth period than did unthinned plants. These results are from one season's data only.

3802. E̊ristavi, L. I.
Pharmacological-botanical studies on the Japanese cinnamon (*Cinnamomum pedunculatum*). [Russian.]
Soobšč. AN. Gruz SSR., 1956, **17**(10): 913-20, from *Ref. Ž.* (*Biol.*), 1958, No. 8, Abstr. 34,851.
Some properties of the Japanese cinnamon as a medicinal raw material. [Russian.]
Tr. Tbilissk. med. In-ta, 1957, **11**: 47-62, from *Ref. Ž.* (*Biol.*), 1958, No. 7, Abstr. 30,100.

C. pedunculatum growing on the Black Sea coast is being investigated as a possible source of a substitute for imported cocoa butter. In addition to solid fat, essential oils were found in the leaves, fruits and shoots to the extent of 1·05–1·43% of dry weight, the pedicels being especially rich in them. Alkaloids, glucosides, saponins and tannins were not found in the fruits.

3803. Evans, W. C., and Wellendorf, M.
The alkaloids of the roots of *Datura*.
J. chem. Soc. Lond., 1959, pp. 1406-9, bibl. 10.

3α-Tigloyloxytropane, hitherto not recorded as a natural product, has been obtained from the roots of *Datura ferox*. Tigloidine, atropine, tropine, *pseudo*tropine and an uncharacterized base have been isolated from the roots of *D. innoxia*. The roots of both species contain 7-hydroxy-3:6-ditigloyloxytropane,(—)-3α:6β-ditigloyloxytropane [see also *H.A.*, 28: 3903h], hyoscine and meteloidine. [Authors' abstract.]—Dep. Pharm., Univ. Nottingham.

3804. Kir'jalov, N. P., and others.
Galbanic acid and its derivatives as new antibiotics of plant origin. [Russian.]
Bot. Žurnal, 1959, **44**: 101-4.

The acid and its derivatives obtained from root extracts of *Ferula kokanica* and *F. gummosa* proved inhibitory *in vitro* to *Staphylococcus aureus*. Methods of isolating the compounds are described.

3805. Edwards, O. E., and Rodger, M. N.
The alkaloids of *Inula royleana*.
Canad. J. Chem., 1959, **37**: 1187-90, bibl. 4.

Inula royleana, a perennial composite found in the lower reaches of the Himalayas, is reputed to have medicinal value. The dried roots gave the phenomenal yield of about 5% alkaloids. These consisted of lycoctonine and anthranoyl-lycoctonine, which had previously been described as royline and inuline, and a third known alkaloid, methyllycaconitine. This is the first recorded occurrence of lycoctonine and its derivatives outside the family Ranunculaceae. In addition, *I. royleana* becomes the richest known source of lycoctonine. —Nat. Res. Coun., Ottawa.

3806. Youngken, H. W.
A study of the root of *Morinda citrifolia* Linné. I.
J. Amer. pharm. Ass., sci. Ed., 1958, **47**: 162-5, illus., from *Biol. Abstr., Sect. D*, 1959, **33**, Abstr. 3,204.

Morinda citrifolia, a shrub or small tree of the Rubiaceae family native to S. Asia, the Philippines, and islands of the South Pacific, possesses roots, extracts of which have been stated to possess hypotensive and anti-congestive properties, but very scanty work has been recorded on their pharmacognosy. In this paper the physical characteristics, histology, and description of the powdered root are discussed. Among the diagnostic anatomical characteristics of this drug are the following: the presence of raphides of calcium oxalate in raphide sacs of the cortex and phloem; a banded secondary xylem; vessels with closely set, circular bordered pits, abundant starch-bearing wood parenchyma; vascular rays from 1- to 5-cells in width; stone cells in both cortex and phellem; starch grains, simple and 2- to 3-compound. The presence of an endotrophic fungus with septate, branched hyphae was observed in all tissues of the roots.—Mass. Coll. Pharm., Boston.

3807. Pontovič, V. E̊.
Sterile culture of the placenta of poppy as a means of studying the formation of seeds and the synthesis of their storage products. [Russian, with English summary ⅓ p.]
Fiziol. Rast., 1959, **6**: 303-11, bibl. 19, illus.

Placentae of heads of *Papaver somniferum* at various stages of development were excised and grown on 4 kinds of sterile media containing glucose, yeast extract and heteroauxin. No seed was retained by placenta from 1-day-old fruits, 2–5 seeds by placenta from 2–3-day-old fruits and up to 40 seeds when 5-day-old fruits were used. The retained seeds developed normally and were viable. The power of seed retention was enhanced by the addition to the media of adenylic acid and even more so by adding coconut milk, which induced the retention of 15–40 seeds on the placenta of 1-day-old fruits and almost all seeds in the case of 4-day-old fruits. Kinetin, however, had no such effect. Seeds of the same age isolated from the placenta did not develop on the media; coconut milk and kinetin induced swelling but not development.

3808. Battersby, A. R., and Harper, B. J. T.
Biogenesis of papaverine.
Proc. chem. Soc. Lond., 1959, p. 152, bibl. 4.

Opium poppy plants were fed with C^{14}-labelled tyrosine. The results confirm conclusively that two molecules of tyrosine are involved in the biogenesis of papaverine.—Univ. Bristol.

3809. Peets, E. A., and others.
Biosynthesis of C^{14}-reserpine by *Rauwolfia* plants.
J. Amer. pharm. Ass., sci. Ed., 1958, **47**: 280-1, from *Biol. Abstr., Sect. D*, 1959, **33**, Abstr. 3,199.

Plants were grown in an atmosphere containing $C^{14}O_2$ for the purpose of biosynthesizing randomly labeled C^{14}-reserpine for use in further metabolic studies. Preliminary experiments indicated that the total activity appearing in reserpine, expressed as percentage of the total activity fixed by the plant, was lowest in plants started from cuttings, higher in old seedling plants and highest in young seedling plants. A total of 64·5 millicuries C^{14} was incorporated into *Rauwolfia* plants to produce approximately 225 mg. of reserpine containing 98 microcuries of C^{14} with a specific activity of 670 microcuries per g. of carbon. [Authors' abstract.]—Columbia Univ., Palisades, N.Y.

3810. Sprecher, E.
Über den Einfluss genetischer und klimatischer Faktoren auf die Biosynthese sekundärer Pflanzenstoffe der Weinraute (*Ruta graveolens*). **(The influence of genetic and climatic factors on the biosynthesis of secondary plant substances of rue (*Ruta graveolens*).**
Pharmazie, 1958, **13**: 151-3, bibl. 19, from *Biol. Abstr., Sect. D*, 1959, **33**, Abstr. 3,202.

Rue was collected in the French Riviera (Cap Roux) and in S. Germany (Karlsruhe): the volatile oil content was markedly higher in the former (leaves, green stem, and root). The difference was somewhat less marked when the plant from France was cultivated under identical conditions at Karlsruhe. Conversely, rutin and other flavonols showed greater development in the German plants. This confirms earlier work [*H.A.*, 27: 625], showing that in the biogenesis of volatile oils temperature (warmth) plays the chief role, but for flavonols light is the decisive factor. In addition to rutin and quercetin, small amounts of 2 other flavonol glycosides were found which could not be identified. —Tech. Hochsch., Karlsruhe.

Essential oils.

(*See also* 3791n, 3802, 3810, 3845b, d, j, o, r, 3913, 4015b.)

3811. British Standards Institution.
Essential oils.
Brit. Standards **2999/1 to 15**, 1958, pp. 34, 7s. 6d.

Details are given of what is necessary to achieve the standard in the following 15 distilled oils: cananga (*Cananga odorata* f. *macrophylla*), celery seed (*Apium graveolens*), cinnamon leaf, Ceylon (*Cinnamomum zeylanicum*), cinnamon leaf, Seychelles (*C. zeylanicum*), cubeb (*Piper cubeba*), lavandin (*Lavandula officinalis* × *L. latifolia*), Japanese mint (*Mentha arvensis* var. *piperascens*), neroli (*Citrus aurantium*), parsley seed (*Petroselinum crispum*), patchouli, East Indian (*Pogostemon cablin*), patchouli, Seychelles and African (*P. cablin*), pepper (*Piper nigrum*), Spanish sage (*Salvia lavandulaefolia*), spearmint (*Mentha spicata*), and vetiver (*Vetiveria zizanioides*).

3812. Reitsema, R. H.
Some new constituents of mint oils.
J. Amer. pharm. Ass., sci. Ed., 1958, **47**: 265-6, from *Biol. Abstr., Sect. D*, 1959, **33**, Abstr. 3,200.

Menthofuran was found to be a major constituent of the oil of *Mentha aquatica*. Diosphenol, piperitenone oxide, diosphenolene, piperitone, piperitenone, limonene and cineol have been identified in *M. sylvestris*. Jasmone has been isolated from American spearmint oil. Dihydrocarvone has been found in several species of mint that contain carvone.—Ohio Oil Co., Denver Res. Center, Littleton, Ohio.

3813. Kračkovskaja, L. P.
Propagation of patchouli. [Russian.]
Tr. Vses. n.-i. In-ta sintet. i natural. duš. Veščestv, 1957, No. 3, pp. 169-78, from *Ref. Ž.* (*Biol.*), 1958, No. 8, Abstr. 34,861.

Pogostemon patchouli, a perennial tropical plant, can only be cultivated in the subtropical parts of the U.S.S.R., such as the Gissar Valley, as an annual. As the seedlings do not flower the first year it has to be propagated vegetatively. Of various methods tried, rooting cuttings, treated with heteroauxin dust, in a layer of sand 6 cm. deep at 20–25° C. gave the best results.

Fibres.

(*See also* 3178, 3845f, 4016.)

3814. Viado, G. B., and Matthysse, J. G.
A field test on the use of insecticides and cover-cropping and their bearing on the control of abacá mosaic.
Philipp. Agric., 1959, **42**: 364-73, bibl. 6.

Cover-cropping with *Centrosema plumieri*, BHC spraying of plants and weeds, Systox spraying of plants alone, Systox spraying of plants and weeds, and Systox treatment of planting material were methods used to reduce mosaic incidence in a newly planted field. Cover-cropping was the best treatment, followed by BHC; they reduced the percentage of stools infected from 33·4% in the control to 12·3% and 17·4%, respectively. Systox had a negligible effect.

3815. Puşcaş, M.
Posibilăţi de dirijare a lungimii coclului de vegetaţie la diferite provenienţe de cînepa. **(The possibility of controlling the length of the growth cycle in different races of hemp.)** [Russian and French summaries.]
Bul. stiint. Acad. R.P.R. sec. biol. si stiinte agric. Ser. bot., 1957, **9**(2): 157-71, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,222.

The effects of long and short days on 2 Italian and 2 Soviet varieties of hemp were studied in pot trials. In short days the growth period of the Italian varieties was reduced by 51% and that of the Soviet varieties by only 11%. In long days the growth period of all varieties increased considerably. In Roumania the cultivation of southern races is recommended, as they produce good stem growth and high fibre yields.

3816. Venema, K. C. W.
Some notes regarding the cultivation and fertilization of matting-grass (*Juncus effusus* L. var. *decipiens* F.B.).
Potash and trop. Agric., 1959, **2**: 14-29, bibl. 11.

Matting grass is cultivated in Japan before and after paddy, and some studies on it are reviewed. Manurial applications to the seedling beds and to the fields are relatively high. Plant contents of K are very high (35–47 me./100 g.) while those of Na are low. Mineral composition of the stalks is strongly influenced by mineral contents of the soil. Trials at Okayama showed that the optimal K application is about 188 kg. of potassium sulphate per hectare. In Hiroshima K fertilization had little or no influence on tillering, but it markedly increased the yield of first quality stalks. Experiments in Hiroshima in 1955 showed that the highest yields and quality were obtained when K was applied throughout the entire growing season. At Okayama tillering was best in plots fertilized with NPK, followed by those receiving NK. Total weight of stalks and average stalk lengths were best in the NPK plot. With an increase of the ratio N+K to Ca+Mg stalk elasticity increased. The application of calcium sulphate to matting grass increased both the Ca content and K uptake; with a luxury accumulation of K stalk elasticity was increased, flower formation decreased, and stem length increased.

3817. Hashimoto, T.
Effects of potassium and calcium fertilizers on the yield and quality of mat rushes. [Japanese, with English summary ¾ p.]
Reprinted from *Bull. Hiroshima agric. Coll.*, 1958, **1**(1): 27-32, bibl. 10.

Dressings of potassium sulphate and calcium sulphate were applied to 7 varieties of rushes used for mat making. Potassium was taken up in abundance, though with differences due to variety, and the ratio $K+Na/Ca+Mg$ largely depended on the amount of K in the plants. Increased K caused a decrease in Young's modulus of elasticity, but it increased yields, rush length and flower formation, and quality was also improved. Increased Ca caused a higher Ca content but also markedly increased the K content with a consequent reduction of Young's modulus. Small Ca dressings promoted growth, but high Ca dressings caused stunting.

3818. Deodikar, G. B., and Patwardhan, S. D.
Wild ramie *Boehmeria platyphylla* D.B. from Western Ghats—a possible source of textile bast fibre.
Curr. Sci., 1959, **28**: 29-30, bibl. 4, illus.

From samples of *Boehmeria platyphylla* 5% on an air-dry basis of bleached fibre was obtained, but its quality was inferior to that of fibre from *B. nivea*. As the species is highly polymorphic trials continue.—M.A.C.S. biol. Labs, Law Coll. Buildings, Poona-4.

3819. Cagat, L. C., and Elopre, T. F.
Studies of growth and yield of seven varieties of ramie propagated by rootstock under AIA conditions.
Araneta J. Agric., 1958, **5**(4): 51-6, bibl. 5.

Selected local varieties were grown under normal field conditions and were evaluated for tensile strength of fibre, percentage of fibre, height of plant and number of stalks per hill. Except for the number of stalks per hill, there were considerable differences between varieties, but no one variety was outstanding in all respects.

3820. Anon.
Italian vegetable hair adaptable for cordage and upholstery.
Cordage, Canvas and Jute World, 1959, **41**(471): 21-2, from *Trop. Abstr.*, 1959, **14**, Abstr. g1412.

Vegetable hair is made from the leaves of the palm *Chamaerops humilis*, which occurs in several Mediterranean regions. It is utilized for the manufacture of cordage, baskets and for upholstery. The gathering of the leaves is not limited to any particular season. The leaves are combed or processed by hackling or carding machines. Gathering and processing are described.

3821. Czaja, A. T.
Die Blattentwicklung der Faser-*Yucca*-Pflanze in Abhängigkeit von der mineralischen Düngung. (**Leaf development in fibre *Yucca* in relation to mineral fertilizing.**) [English summary ¾ p.]
Qual. Plant Maveg., 1959, **6**: 39-68, bibl. 18.

Leaf development of *Yucca*, growing in poor soil in tubs, showed the greatest improvement when the fertilizer ratio of $N : P_5O_2 : K_2O$ was 1 : 1 : 1·75. The number of leaves produced in 3 years was increased by 40% when the N constituent was ammonium sulphate, and by 100% when it was calcium cyanamide, but the former N source gave a somewhat greater increase than the latter in leaf size. Moderate applications of K or P+K produced little effect, but heavy applications of P+K gave results almost as good as those from normal rates of complete (NPK) fertilizer. Omission of K had little or no effect on either the size or the number of leaves. Neither lime nor Mn enhanced the action of NPK.—Tech. Hochsch. Aachen.

Hops.

(*See also* 3845e, q, w, 4139.)

3822. D.S.I.R., N.Z., and Cawthron Institute.
Hop Research. Annual Report for 1957-58, pp. 2.

Three seedlings resistant to root-rot are about to be released; Bullion has proved the best of the Wye varieties but is not suitable for root-rot infested soil. No yield differences were apparent in this season between plants growing on hills covered with a thin layer of soil and those from which the soil was removed in the first week of November. Blitox was not adequate for control of *Phytophthora cactorum*. In a trial comparing sources of N, casein produced a yield of 1,830 lb. of dry hops/acre, which was significantly higher than the 1,591 lb./acre produced by dried blood; urea decreased ash, Ca and Mg contents of the cones and leaves, decreased the K_2O content of the leaves and increased the K_2O content of the cones. The highest yield with applications of mixed fertilizer were obtained with 15 cwt. per acre (2,214 lb. hops per acre), and this was significantly higher than the yield from 5 cwt./acre (1,751 lb. per acre). The application of B significantly increased yields above those obtained from Mg or Mo applications; alpha resin contents were highest where B or Mo were supplied alone or in combination with magnesium sulphate. In a study of cone growth, contents of reducing sugars were highest just before mid-February, and the maximum sucrose content occurred a few days before this; resins increased as sugars decreased. [See also *H.A.*, 29: 999.]

3823. Miller, R. H.
Morphology of *Humulus lupulus*. II. Secondary growth in the root and seedling vascularization.
Amer. J. Bot., 1959, **46**: 269-77, bibl. 9, illus.

In the primary state the roots of *Humulus lupulus* L. have a diarch xylem plate with 2 strands of primary phloem lying on either side of the primary xylem. Secondary histogenesis is described for the primary root. Fibrous and fleshy storage roots are developed by the hop plant, and their respective developmental and anatomical structures are described. Lateral roots are initiated in the pericycle opposite the protoxylem poles. The architecture of these secondary roots is similar to that of the primary root. The seedling develops a fleshy storage organ through secondary growth of the primary root and the hypocotyl. The hypocotyl eventually resembles a fleshy taproot throughout most of its extent. The vascular cambium differentiates large amounts of parenchymatous tissues. A relatively smaller amount of tracheary tissue is formed. The secondary phloem comprises a high percentage of phloem parenchyma and ray cells containing numerous large starch grains, and constitutes the larger portion of the fleshy storage root. Numerous thickwalled lignified fibers occur throughout the secondary vascular tissues. Resin and tannin cells are abundantly distributed. A phellogen is differentiated from the pericycle and develops a persistent periderm on the outer surface of the fleshy storage organ. A relatively short transition region occurs in the upper part of the hypocotyl. The transition takes place from a radially alternate arrangement of the vascular tissues in the root to a collateral arrangement in the cotyledons. [Author's abstract. For part I see *H.A.*, 28: 3880.] —Univ. Nevada, Reno.

3824. Fang, T.-K.
Observations on the morphology and anatomy of the rhizome of hops (*Humulus lupulus* L.).
[Chinese, with English summary 2 pp.]
Acta bot. sin., 1957, **6**: 297-310, bibl. 14, illus.

A detailed account is given of the anatomy of the rhizomes of hop plants of various ages. Among the tissues present are secretory cells and secretory canals. Analyses showed these to contain tannin, resin, mucilage and protein, and possibly also essential oil.

3825. Marocke, R.
Fumure des sols à houblon de Basse-Alsace. **(Manuring hop soils in Lower Alsace.)**
Ann. agron., 1958 (issued 1959), **9**: 364-6.

General recommendations based on past investigations and converted into pounds per acre are: For a plantation carrying 1,336 plants per acre 4·3–6·4 tons of F.Y.M. per acre should be ploughed in in early winter. The actual requirements in mineral elements are estimated at N 176, P_2O_5 53, K_2O 151 and CaO 270 lb. per acre. Nitrogen should be given at the rate of 80–98 lb. per acre on non-permeable soils, two-thirds being applied at the beginning of growth and the rest a few weeks after flowering, and on permeable soils at 107–127 lb. per acre, part at beginning of growth and part just before flowering. Ammonium nitrate is preferable for earlier varieties, nitrate of lime or soda for later ones. P_2O_5 should be applied at 71–80 lb. per acre, supers being used for very slightly acid, neutral or alkaline soils, slag for others. K_2O should be applied at 133–142 lb. per acre as K_2SO_4. The P and K fertilizers should be applied when ploughing in early winter.—Colmar, Alsace.

3826. Marocke, R.
Études sur la toxicité du bore chez le houblon. **(Studies on boron toxicity in hops.)**
Ann. agron., 1958 (issued 1959), **9**: 406-8.

The symptoms of boron toxicity, which affects the hop most in heavy soils, were demonstrated in pot experiments at Colmar, Alsace. They were as follows: 1. *Slight*. At the start of growth the leaves have a chlorotic appearance, the chlorosis affecting the leaf surface but not the leaf veins which remain dark green. Gradually with growth the symptoms become fainter and finally disappear except for such phenomena as might well be mistaken for Mg deficiency symptoms. 2. *Severe*. The whole of the leaf is chlorotic and the marginal leaf tissues dry up and die. The general effect is that the sides of the leaves roll up a little so that the leaf becomes cup shaped. Leaf fall at this stage cannot be prevented. The apical meristem of the stem dries very rapidly and this checks further extension growth. Internodal growth stops, but the secondary meristems continue to function, which permits the stem to increase its girth normally. The death of the apical meristem results in the immediate very active development of laterals issuing from the axillary buds of the stalk which give the plant a bushy appearance. At the beginning of their development the new leaves borne on the laterals are more or less chlorotic, their margins slightly necrotic and showing the rolling up noted above. Later they become a normal green colour but do not grow and remain rolled. 3. *Lethal effects*. First phase as before, but the small laterals do not grow, and the buds from which they spring dry up. Necrosis of the apical meristem follows and spreads to the whole plant.

3827. Legg, J. T.
The effect of split leaf blotch and nettlehead virus diseases on the yield of Fuggle hops.
J. hort. Sci., 1959, **34**: 122-5, bibl. 5.

In 2 trials comparing yields from plants showing symptoms of either split leaf blotch or nettlehead with those from symptomless plants, there was a reduction of about 50% in the weight of hops from plants with split leaf blotch and of over 75% from plants with nettlehead. In view of the prevalence of split leaf blotch in the widely planted variety Fuggle, it is suggested that this must be regarded as one of the most serious diseases of hops. [Author's summary; see also *H.A.*, 29: 2685.]—East Malling Res. Stat., Kent.

3828. MAIER, C. R.
Streptomycin absorption and translocation by hops (*Humulus lupulus* L.), and effects of streptomycin on the hop downy mildew disease.
Diss. Abstr., 1959, **19**: 3097, being *L.C. Card No. Mic.* 59-1710 of 147 pp.

Streptomycin was readily absorbed by hops from preparations applied in foliar sprays and in lanolin paste, but absorption was negligible from soil applications. Rapid upward translocation occurred in greenhouse trials with streptomycin, but no downward translocation was detected. Streptomycin was taken up in greater amount, and retained for longer periods, in field-treated hops than in greenhouse plants. A second application of a 1,000-p.p.m. spray applied 16–21 days after the first produced higher levels and longer retention than did a single application [see also *H.A.*, 28: 649p]. The minimum systemic concentrations that effectively reduced secondary leaf infection were between 12 and 19 p.p.m., and for eliminating established infection from systemically diseased shoots were between 46 and 69 p.p.m. Four effects of streptomycin on fungus control and renewed bine growth in the field are described, together with changes in fungus morphology produced by the antibiotic.—Ore. St. Coll.

3829. HARTONG, B. D., AND ISEBAERT, L.
The conductometric determination of α acids in green hops on the hop farm. [French, Spanish and German summaries ¾ p. each.]
Wallerstein Lab. Commun., 1959, **22**: 17-26, bibl. 6.

The conductometric method for determining α acids in dried and green hops has previously been reported [see *H.A.*, 28: 631, and *Int. Tijdschr. Brouw. Mout.*, 1958-59, **18**: 1]. Analytical results from 3 seasons' crops of Belgian replants showed that harvest ripeness (based on α acids content) varied with variety, and that picking was sometimes started too soon. Weather conditions, particularly sunshine, appeared to influence α acids contents, which increased after a sunny day.—Phoenix Brouw., Amersfoort, Holland, and V.E.B.O., Ghent, Belgium.

3830. ZUB, L.
Uwagi o określaniu wartości technologicznej surowca chmielowego. (**On defining the technological value of hops.**)
Przem. Spoż., 1958, No. 6, pp. 230-4, from *Polish tech. Abstr.*, 1959, No. 1(33), p. 103.

Chemical analyses were used as a basis for comparing the brewing and botanical characteristics of Polish, German and Czechoslovakian hops. Polish hops had the highest contents of total resins, although in German hops soft resin contents were higher. Polish hops were inferior to foreign hops in botanical characters.

3831. OWADES, J. L., GIMBEL, L. S., AND SCHWARTZ, B. W.
Hop evaluation and changes during storage.
Amer. Brewer, Nov. 1958, pp. 49-52, 55, from abstr. in *J. Inst. Brew.*, 1959, **65**: 199.

Spectrophotometric determination of the α and β acids in 21 samples representing 6 varieties of hops showed that both groups of acids, and especially the β acids, decreased during 3, 6 and 9 months of storage. The stability of the acids was improved by storage at 32° F., and it seems probable that cold storage is even more beneficial to other hop components such as the volatile oils. Although the β acids decrease with storage, particularly at room temperature, the β fraction, which includes the β acids and other compounds, actually increases during storage. Of the 6 varieties examined 4 (Yakima, Idaho, Eastern Oregon and Californian Seedless) were relatively stable during storage and 2 (Oregon Fuggles and Oregon Bullions) relatively unstable. The former group contains hops of only one genetic type (Clusters), while the latter group comprises different genotypes.

Insecticidal plants.

(*See also* 3845m, t, 4016, 4154.)

3832. SPOON, W., AND LOOSJES, F. E.
Samenstelling en eigenschappen van rotenonhoudende *Mundulea*-bast. (**Composition and properties of *Mundulea* bark, containing rotenone.**) [English summary ¾ p.]
Tijdschr. PlZiekt., 1959, **65**: 79-88, bibl. 9, illus.

Samples of *Mundulea sericea* bark from Java and Nigeria were compared. The Javanese bark was shown to contain rotenone, whereas none was detected in Nigerian bark. The powdered bark from Java was more effective than *Derris* powder when used as a dust for caterpillar control; Nigerian bark had only a slight insecticidal effect.—Kon. Inst. Tropen, Amsterdam, and PlZiektDienst, Wageningen.

3833. JONES, G. D. G., AND STEPHENSON, H.
Preliminary experiments on the storage and subsequent processing of undried pyrethrum flowers.
Pyreth. Post, 1959, **5**(1): 13-18, bibl. 14.

Attempts were made to overcome the climatic handicap of the East African pyrethrum industry by finding a satisfactory method of extracting pyrethrins from undried flowers, both fresh and stored. Ensiling flowers was satisfactory, but required too high a degree of skilled control to be a practical commercial proposition. Maceration, if thoroughly carried out, gave a satisfactory product for extraction, and some success was achieved in stabilizing the macerate with hydrochloric acid and sulphur dioxide.—Res. Labs., Pyreth. Bd. Kenya, Nakuru.

3834. Spoon, W.
Het tropische plantaardige insekticide ryania. (**The tropical plant insecticide ryania.**) [English summary ½ p.]
Landbouw. Tijdschr., 1959, **71**: 369-73, bibl. 6.

In Trinidad *Ryania pyrifera* is periodically coppiced and the wood dried and exported to the U.S.A., where it is ground and sold under the name ryania. The active principle, the alkaloid ryanodine, extracted with chloroform from 3 samples, was present in amounts averaging 1·1%. In large-scale trials over 5 years in Java 500–750 g. rotenone (in the form of derris dust) and 7·5–12·5 kg. ryania 40% dust have given similar control of several sugar cane stalk borers, which suggests that ryanodine by itself would be 14 to 15 times as active as rotenone.

Rubber plants.

3835. Kudrjaševa, O. I.
***Taraxacum tadshikorum* Ovcz.** [Russian.]
Tr. In-ta botan. AN Tadz SSR, 1956, **47**: 103-32, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,227.

The latex of this species differs from that of kok-saghyz and krym-saghyz in having a lower rubber and higher resin content. The rubber, amounting to 0·64–2·43% per absolute dry weight of roots, is of poor quality.

3836. Galkina, N. V., and Mothin, I. N.
The effect of associated crops of the Uzbek tau-saghyz on its seed regeneration. [Russian, with Uzbek summary].
Dokl. AN UzSSR, 1957, No. 2, pp. 45-8, from *Ref. Ž.* (*Biol.*), 1958, No. 7, Abstr. 29,907.

Seed of tau-saghyz sown among growing *Salsoa montana* did not germinate; sown among *Artemisia glandulifera* a few seedlings were obtained but they died, whereas in association with *Aneurolepidium alaicum* a good stand resulted. In the laboratory the germination of tau-saghyz seed in extracts of the 3 species gave similar results.

Seed oils.

(*See also* 3545, 3845k, x.)

3837. Rivoira, G.
Esperienze sulla coltivazione del ricino in Sardegna. (**Trial cultivation of castor beans in Sardinia.**)
Stud. sassar. Sez. III, 1957, 1959, **5**: 97-112, bibl. 5, illus.

One season's unirrigated trials with 12 types of castor bean originating in Morocco, Italy and the U.S.A. are described. Of them the so-called Hybrid 4 from the U.S.A. and S.O. 62 from Morocco, with respective estimated returns of 532·7 kg./ha. and 437·4 kg./ha. oil production, were the best, but were not considered very satisfactory. They are to be tested again both with and without irrigation.

3838. Rautavaara, T.
Unikonsiemeniä suontenkalkkiutumisen torjuntaan. (**Poppy seeds against arteriosclerosis.**)
Puutarha, 1959, **62**: 198-9, illus.

Suitable German poppy varieties are suggested for Finland, where oil seeds in general are richer than those of southern Europe in the types of fatty acid which prevent deposition of cholesterol in the circulatory system.

3839. Prokof'ev, A. A., and Holodova, V. P.
Water content and ripening of seeds. [Russian, with English summary ¼ p.]
Fiziol. Rast., 1959, **6**: 190-6, bibl. 17.

In the oil poppy the moisture content of the seeds was found to be closely related to ripening and could be used as an index of maturity. Maturity is indicated by the disappearance of monosaccharides and by oil accumulation. A correlation was also established between the moisture content of the seeds and that of the air inside the capsule. The reduction in the moisture content of ripening seeds is due mainly to translocation.

3840. Rubis, D. D., and Black, D. S.
Gila—a new safflower variety.
Bull. Ariz. agric. Exp. Stat. **301**, 1958, pp. 5, illus.

Resistance to root rot (*Phytophthora drechsleri*) is combined with good agronomic characters in this variety, which is adapted for production in irrigated areas.

3841. Singh, H. P., and Sinha, N. S.
Possibilities of using kardi cake as a manure.
Indian Sugar, 1959, **8**: 613-17, bibl. 6.

At the Shahjahanpur Sugarcane Research Station, kardi cake (the press cake from safflower seed), which contained 2·53% N, was found unsatisfactory by itself, but good nitrification was obtained in the soil when it was mixed with sulphate of ammonia.

Sundry plants.

(*See also* 3845a, l, u, 3904, 3905, 3932.)

3842. Byers, M., and others.
Large-scale production of leaf protein.
A.R. Rothamsted exp. Stat. 1958, 1959, pp. 93-5.

Nettles growing wild, except for some manuring, yielded 546 lb. of extracted protein per acre. A rather mature batch of river weeds yielded 47% of their protein on extraction. The extracted plant proteins are normally stored in deep-frozen 5-lb. blocks with a 50% water content. Canning has not proved wholly satisfactory, and other methods of sterilization are being investigated. Ravioli and cromeskis are used as means of presenting the product for human consumption. In animal nutrition the protein is equivalent in nutritive value to high-grade fish meal.

3843. Rivals, P.
Sur la reproduction et la multiplication des bambous. (**On the reproduction and multiplication of bamboos.**)
Rev. agric. Réunion, 1959, **59**: 13-20.

This popular article describes suitable species for temperate climates (mainly *Phyllostachys* spp.), reproduction by seed including the induction of flowering by wounding, vegetative reproduction methods, and various uses of bamboos.—Éc. nat. supér. agron. Toulouse.

3844. Miller, C. D., and Hamilton, R. A.
Yucca flowers as food.
Hawaii Fm Sci., 1959, **7**(3): 7-8, illus.

The flower buds of the izote, *Yucca elephantipes*, contain 475 mg. and the flowers 371 mg. of ascorbic acid per 100 g., of which about 5 and 10% respectively are lost on cooking. Izote buds and flowers are widely used as food in Central America.

Noted.

3845.

a Anon.
Cera de candelilla. (**Candelilla wax.**)
Comerc. exterior México, 1959, **9**: 98-100, from *Trop. Abstr.*, 1959, **14**, Abstr. g1317.
Production and trade in wax from *Euphorbia antisyphylitica* grown mainly in arid N. Mexico at 1,000–2,000 m. altitude.

b Barbier, E. C.
Observations préliminaires sur la distillation de l'essence de lavandin par entrainement à la vapeur d'eau. (**Preliminary observations on the steam distillation of lavandin oil.**)
C.R. Acad. Agric. Fr., 1959, **45**: 141-52, bibl. 3.
Technique and results, including details of 28 fractions.

c Bojčinov, A.
A pharmacognostic monograph on the roots of *Chenopodium bonus Henricus* L. [Bulgarian, with Russian summary.]
Farmacija, 1957, **7**(2): 16-19, from *Ref. Ž. (Biol.)*, 1958, No. 8, Abstr. 34,852.
Haemolytic activity of the roots about 1 : 1,600; saponin (chenopodin) was isolated.

d Borkowski, B., and Chochlew, L.
Wpływ temperatury na tworzenie się olejku w liściach mięty pieprzowej (*Mentha piperita* L.). (**The effect of temperature and humidity on essential oil formation in the leaves of peppermint (*M. piperita*).**
Biul. Inst. Rošl. leczn., 1957, **3**(2): 123-31, from *Ref. Ž. (Biol.)*, 1958, No. 7, Abstr. 30,121.
Low humidity and high temperature increased the essential oil content.

e de Clerck, J., and Jerumanis, J.
Estimation of the humulone of hops by conductometric titration. [French?]
Bull. Ass. Éc. Brass. Louvain, 1958, **54**: 249-53, from abstr. in *J. Inst. Brew.*, 1959, **65**: 199.
Compares favourably with the gravimetric method.

f Commonwealth Economic Committee.
Industrial fibres.
[*Publ.*] *Commonw. econ. Cttee, 1959*, pp. 223. 10s.
Production and trade in natural and synthetic fibres.

g Felklová, M., and Babková, K.
Anatomische Studien über die Milchröhren bei *Papaver somniferum* L. während der Vegetationszeit. (**Anatomical studies on the latex vessels in *Papaver somniferum* during the vegetative period.**)
Pharmazie, 1958, **13**: 220-9, from *Biol. Abstr., Sect. D*, 1959, **33**, Abstr. 2,848.
In roots, leaves, stems and capsules, in relation to fluctuations in morphine content [see *H.A.*, 29: 637].

h Flach, M.
De huidige welvaartsbron van Fak-Fak: de cultuur van muskaatnoot en foeli. (**The present source of prosperity of Fak-Fak: the cultivation of nutmeg and mace.**)
Ned. Nw-Guinea, 1959, **7**(2): 18, 19, 21, illus., from *Trop. Abstr.*, 1959, **14**, Abstr. g1314,
History of *Myristica argentea*, the Papuan nutmeg, in New Guinea.

i Goodwin, S., Smith, A. F., and Horning, A. C.
Alkaloids of *Ochrosia elliptica* Labill.
J. Amer. chem. Soc., 1959, **81**: 1903-8, bibl. 16.
Leaves yielded 4 alkaloids including isoreserpiline (elliptine).

j Guenther, E., Kulka, K., and Rogers, J. A.
Essential oils and related products.
Analyt. Chem., 1959, **31**: 679-85, bibl. 39.
A review of analytical procedures.

k Jasso, R. G.
El azafrancillo. **(The safflower.)**
Agric. téc. México, 1958-59, No. 7, pp. 16-17, illus.
A preliminary report on its introduction to the Yaqui Valley area of Mexico, including seed composition.

l Lazur'evskij, G. V., and Novohatka, D. A.
The tannins of *Cotinus*. [Russian, with English summary 5 lines.]
Biohimija, 1959, **24**: 9-14, bibl. 11.
Myricetin, gallic acid and 3 gallo-glucosides isolated from the leaves.

m Levy, L. W., and Geller, D.
A note on the detection of the "isopyrethrins".
Pyreth. Post, 1959, **5**(1): 12, bibl. 4.
Two sulphur-colour methods compared.

n Ministry of Agriculture, London.
Chicory as a root crop.
Adv. Leafl. Minist. Agric., Lond., **472**, 1959, pp. 3, 3d.

o Ognianov, I., and Ivanov, D.
Bulgarian zdravets [geranium] oil. IV. Sesquiterpene oxygen compounds in the eleoptene of the oil. [English, with Russian summary 4 lines.]
C.R. Acad. bulg. Sci., 1958, **11**: 469-72, bibl. 6.
For part III see *H.A.*, 29: 2710 l.

p Parsa, A.
Medicinal plants and drugs of plant origin in Iran. I and II.
Qual. Plant. Maveg., 1959, **5**: 375-94, and **6**: 69-96.
Annotated alphabetical list, up to and including *Dolichos lablab*.

q Piratzky, W., and Beitner, H.
Eine refraktometrische Methode zur Bestimmung der Bitterstoffe im Hopfen. **(A refractometric method for determining hop bitter substances.)**
Brauwelt, 1957, **97**: 742-4, from abstr. in *Wallerstein Lab. Commun.*, 1959, **22**: 52.
Taking about 50 minutes and accurate to ± 3%.

r Reitsema, R. H.
A biogenetic arrangement of mint species.
J. Amer. pharm. Ass., sci. Ed., 1958, **47**: 267-9, illus., from *Biol. Abstr., Sect. D*, 1959, **33**, Abstr. 3,427.
Classification based on chemistry of their oils.

s Shibata, M., and Takakuwa, N.
On the fat and oil in the perianth of *Fritillaria camschatcensis* Ker-Gawl.
Phyton, 1959, **12**: 25-6, bibl. 5.
Yield about 5% of air-dried material; chemical and physical properties given.

t Smith, H. J.
A modified 2:4-dinitrophenylhydrazine (DNP) method for the determination of "pyrethrin I" and "pyrethrin II".
J. Sci. Food Agric., 1959, **10**: 260-7, bibl. 17.

u Sokolov, P. D.
The tannin content of *Polygonum divaricatum*. [Russian.]
Bot. Žurnal, 1959, **44**: 116-17, bibl. 6, illus.
Between 4·26 and 10·99% in the roots of wild plants and up to 20% in those of cultivated 4-year-old plants.

v Suzuki, Y.
Transamination of certain amino acids in *Scopolia japonica*.
Phyton, 1959, **12**: 27-9, bibl. 17.
In underground stems.

w Trolle, B., and Djurtoft, R.
Conductometric method of determining the α acids of hops and their brewing value. [German?]
Brauwissenschaft, 1958, pp. 283-6, from abstr. in *J. Inst. Brew.*, 1959, **65**: 199.
Method produces α acid values corresponding to brewing values found in practice.

x U.S. Department of Agriculture.
Growing safflower, an oilseed crop.
Fmrs' Bull. U.S. Dep. Agric. **2133**, 1959, pp. 16, illus.
Crop needs, management, diseases and economic factors.

y Vidal, J.
La thérapeutique par les plantes au Laos. **(Medicinal plants of Laos.)**
J. Agric. trop. Bot. appl., 1958, **5**: 601-16, bibl. 31, illus.
A short review of indigenous therapy.

z Wassberg, C.
A study of the growth effects produced by 2,4-D in the flowers and fruits of *Datura stramonium* L. and *Datura tatula* L.
Diss. Abstr., 1959, **19**: 3105, being *L.C. Card No. Mic.* 59-1242 of 62 pp.

FLORICULTURE.

General.

(*See also* 3186, 3187, 3191, 3558, 3943f, 4130, 4144.)

3846. Dänhardt, W., and Kühle, G.
Versuche zur Ermittlung des günstigsten Torf-Ton-Verhältnisses bei der Verwendung von Torfkulturerde für Topfpflanzen. **(Experiments on the most favourable peat-clay ratio in standard peat soils to be used for pot plants.)** [Russian and English summaries 30 and 27 lines.]
Arch. Gartenb., 1959, **7**: 157-74, bibl. 5.

Tests of different peat-clay mixtures for *Cyclamen persicum*, *Sinningia hybrida*, *Calceolaria herbeohybrida* and *Primula malacoides* led to the following conclusions: In all 4 species growth was promoted by a relatively high peat content, the optimum for *Cyclamen*, *Calceolaria* and *Primula* being 6–9 parts of peat (out of 10 parts), though pure peat proved very unsatisfactory as a medium. In the case of *Sinningia hybrida*, however, growth increased uniformly through all the gradations from pure clay to pure peat. In the case of *Cyclamen* conductivity and nutrient content were determined at the end of the period of cultivation. It was found that conductivity rises with an increase in peat, which means that leaching is reduced by a higher peat content in the mixture. It is believed that other ornamental plants also benefit from a peat-clay mixture containing 6–9 parts of peat. The failure of the three species to grow in pure peat may have been due to the fact that acid fertilizers were used. The experiments are being continued. —Inst. f. Gartenb., Dresden-Pillnitz.

3847. Hiller, W.
Die Assimilation von Zierpflanzen unter dem Einfluss von Seitenlicht. **(The effect of lateral light on the photosynthesis of ornamental plants.)**
Arch. Gartenb., 1959, **7**: 69-79, bibl. 2, illus.

An accurate method is described of measuring the effective light intensity available to the plant, with special reference to the spherical photo-element developed by Rupprecht which makes the measurement of radiation independent of its direction. For various ornamental species, the photosynthetic efficiency of side light in glasshouses was found to range from 70% to almost 100% of that of top light.—Inst. ZierpflBau, Humboldt-Univ. Berlin.

3848. v. Hentig, W.-U.
Erste Versuchsergebnisse mit Gibberellin. **(Preliminary results of experiments with gibberellin.)**
Gartenwelt, 1959, **59**: 233-4, illus.

Sprays of gibberellin (GA) at 10 mg./l. generally increased vegetative growth and improved flowering of cineraria, primula, geranium and kalanchoë, and its effect tended to increase with the number of applications. The length of cineraria stems and petioles was increased by GA, but there was some leaf chlorosis; flowering was earlier in treated plants. The growth habit of *Primula malacoides* and *P. obconica* was not altered by GA treatment, but flowering of both species was earlier and more prolific. Some leaf chlorosis followed GA treatment with *P. obconica*, but this was corrected by a liquid feed. Chlorosis also occurred in leaves of treated kalanchoë plants (variety Tom Thumb), which produced some pendulous growth after treatment. The geranium varieties Schwarzwälderin and Lerchenmüller responded to GA by producing larger flowers, but Black Vesuvius made elongated growth before flowering.—Inst. ZierpflBau, techn. Univ., Berlin.

3849. Pelton, J. S.
Growth responses of alpine *Potentilla diversifolia* and *Achilles lanulosa* to gibberellic acid.
Butler Univ. bot. Stud., 1958, **13**: 215-18, bibl. 3, illus.

Alpine plants of *Achillea lanulosa alpicola* and *Potentilla diversifolia* were transplanted to a lower altitude in Gunnison County, Colorado, and treated with a 0·01% aqueous solution of gibberellic acid. Measurement of total height showed increases of 120% in *Potentilla* and 89% in *Achillea* in the treated plants as compared with the controls. Leaf lengths in plants of both species were longer after applications of gibberellic acid, this increase being mainly the result of greater petiole length in the treated leaves as compared with the controls. [From author's summary.]

3850. (Sherwood, C. H., and Shurtleff, M. C.)
Greenhouse sanitation is an important problem in flower production.
Ia Fm Sci., 1959, **13**: 225-6, illus.

The spread of pests and diseases among susceptible flower crops (poinsettias and lilies) was reduced by regular treatments with low concentrations of parathion, ferbam and PNCB. Diseases were also prevented from spreading by standing pot plants on coarse wire mesh fixed to frames used as sectional bench tops, and by using a mixture of 6 parts pea gravel and 1 part cement under the benches.

3851. Nelson, P. E., and Dimock, A. W.
The effect of greenhouse cooling systems on the development of plant diseases.
Bull. N.Y. St. Flower Grs, 1959, No. 161, pp. 1, 4.

Disease incidence was investigated in several crops grown in an uncooled house and in houses cooled by low-pressure mist, the pad and fan system and a high pressure fog system. Symptom expression of vascular wilts of carnations, chrysanthemums and snapdragons was not affected by the system of glasshouse cooling used. Rust on snapdragon and carnation developed most rapidly and abundantly in the pad and fan house and least in the uncooled house. Carnation plants inoculated with *Alternaria dianthi* and geranium plants inoculated with *Xanthomonas pelargonii* showed more severe symptoms under mist than in either the pad and fan or uncooled house. Rose mildew was slight in the mist house but occurred sporadically in the other houses depending on the position of the plants within the house.

3852. STRONG, R. G., SBUR, D. E., AND PIEPER, G. R.
Effect of several pesticides on the germination of three varieties of flower seeds.
J. econ. Ent., 1959, **52**: 355, bibl. 1.

Of more than 1,100 varieties of flower seeds stored in a warehouse, mites consistently infested only certain varieties of *Centaurea cyanus*, *Iberis umbellata* and *Alyssum procumbens*. Germination tests, made up to 6 months after treatment with Aramite, Chlorobenzilate, Kelthane, Ovex, Tedion and malathion, indicated that the materials may be applied to seeds of the 3 varieties for mite control without seriously decreasing germination.—Univ. Calif., Riverside.

3853. HELLE, W.
Het voorkomen van resistentie tegen organische fosforverbindingen bij de bonespintmijt (*Tetranychus urticae*) in Aalsmeer. **(The occurrence of resistance to organophosphorus compounds in the two-spotted spider mite at Aalsmeer.)** [English summary $\frac{3}{4}$ p.]
Tijdschr. PlZiekt, 1959, **65**: 107-15, bibl. 11.

Resistance to organo-phosphorus compounds was discovered in 20 out of 22 glasshouse populations of *Tetranychus urticae*. Chlorinated hydrocarbon compounds were normally active against these resistant populations. There was no correlation between type of host plant (carnations, roses and gerberas) and the occurrence of resistance in the mites.—Proefst. Bloem., Aalsmeer.

3854. PETERS, C. W.
Direct mail shipments of Hawaiian cut flowers and foliage.
Agric. Econ. Bull. Hawaii agric. Exp. Stat. **15**, 1958, pp. 30, illus.

This is a purely business appraisal of present marketing practice and the possibility of expanding it. The commodities considered are: *Vanda* orchids, *Cattleya* and other miscellaneous orchids, *Vanda* leis, fresh cut flowers and dry cut flowers. They are sent by air or ship to the U.S. mainland.

Annual and herbaceous plants.

(*See also* 3125, 3132, 3720, 3722v, 3848, 3851, 3942a, d, f, h, k, l, n, p, s, z, 3943a, 4129, 4152.)

3855. MACFARLANE, I.
Clubroot of crucifers.
A.R. Rothamsted exp. Stat. 1958, 1959, p. 111.

The stimulatory effect of cabbage root diffusate on the germination of resting spores of *Plasmodiophora brassicae* was confirmed. Among ornamental crucifers inoculated with the disease, the percentage of plants affected was 100 in *Arabidopsis thaliana*. 30 in *Arabis alpina*, 22 in *Alyssum maritimum* and 10 in *Cheiranthus allionii*. Plants of *Aubretia* sp. showed no symptoms.

3856. DOORENBOS, J.
Response of china aster to daylength and gibberellic acid. [Dutch summary $\frac{1}{2}$ p.]
Euphytica, 1959, **8**: 69-75, bibl. 1.

The number of leaves produced by china aster plants before flower initiation was much greater in short-day conditions than in long days. In long days floral induction was completed about 6 weeks after sowing. Inflorescence development was faster in short days than in long days, and in continuous short days or long days plants flowered almost simultaneously. Plants transferred from long days to short days 6 weeks after sowing flowered about a month earlier than those kept in continuous long days. Gibberellic acid (GA_3) did not affect flower initiation in long days, but did reduce the number of leaves appearing before the inflorescence in short days. A method is described which allows the development of 2 generations in one year, thus reducing the time required for breeding projects.—Lab. TuinbPl., Wageningen.

3857. ALSTON, R. E.
Effect of light upon leucoanthocyanin synthesis in *Impatiens balsamina*.
Bot. Gaz., 1958, **120**: 99-101, bibl. 5.

Seedlings of a strain of *Impatiens balsamina* L. which produces leucoanthocyanin in the hypocotyl, but not anthocyanins, were grown in the dark and in the light. In successive measurements up to 18 days following germination, the leucoanthocyanin content per plant was about twice as high in the material growing in light. Leucoanthocyanin enhancement in light may be through some relatively direct effect or perhaps indirectly due to the occurrence of photosynthesis. [Author's summary. See also *H.A.*, 28: 3285b.]—Univ. Texas, Austin.

3858. Mathon, C.-C.

Contribution à l'étude expérimentale de l'écologie et des rythmes du développement chez les Campanulacées (campanulées et lobéliées). **(An experimental study of the ecology and developmental rhythm of the Campanulaceae (campanulas and lobelias).)**

Phyton, 1959, **12**: 13-23, bibl. 23.

The species studied can be divided into two groups, one requiring fairly uniform conditions—long days and temperatures above 10° C.—and the other needing seasonal variations in day-length and winter chilling to induce flowering. These are described respectively as *rythmophytes* and *a-rythmophytes*.—Stat. Biol. vég. appl., Fac. Sci. Poitiers, France.

3859. Butterfield, N. W.

Modern culture of carnations.

Flor. Exch., 1959, **132**(20): 10, 13, 45.

Methods likely to give good returns in the New England area are reviewed and discussed. An experiment (carried out by E. C. Gasiorkiewicz) is described, in which yields were 27·4% higher with plants grown from disease-free, cultured cuttings than from uncultured plants. This represented a gain of 7·08 flowers per square foot.—Univ. Mass.

3860. Jenkins, J. E. E.

Methods for the detection of vascular wilt pathogens in carnation cuttings.

Plant Path., 1959, **8**: 23-7, bibl. 11.

An examination of methods for the detection of *Verticillium* wilt, *Fusarium* wilt, bacterial wilt and slow wilt in carnation cuttings has shown that the most convenient and best nutrient medium and surface sterilizing agent are nutrient broth + dextrose, and Clorox (sodium hypochlorite). The tubes should be incubated at 24° C. for ten days. A method which has been successfully used by growers is outlined. [Author's summary.]—N.A.A.S., Lea Valley adv. Unit, Cheshunt, Herts.

3861. Baker, R.

Sprays for the control of *Fusarium* stem rot of carnations.

Bull. Colo. Flower Grs' Ass., 1958, No. 105, from abstr. in *Bull. N.Y. St. Flower Grs*, 1959, No. 159, p. 3.

Sprays of captan alone and in combination with ferbam, Glyodin and Panogen 15 were applied to mother blocks after weekly inoculation with *Fusarium roseum* f. *cerealis*. Isolations from cuttings taken from blocks that had been sprayed with captan, ferbam, captan plus ferbam, and captan plus Glyodin, showed very little *F. roseum* f. *cerealis*. Captan is recommended for the protection of carnation mother blocks.

3862. Hahn, E.

Versuche zur Bekämpfung der Nelkenfliege. **(Experiments on the control of carnation fly.)**

Dtsch. Gartenb., 1959, **6**: 121-2, illus.

Certain Wofatex preparations and the systemic insecticide Tinox proved satisfactory for the control of *Phorbia* spp., especially *P. brunescens*, on carnations. Small droplets were necessary to wet the leaves thoroughly.—Biol. Zentralanst. Berlin, Zweigst. Potsdam.

3863. Ono, H., and Takanashi, Y.

Experiments on the vinyl mulching of vegetables and flowers. [Japanese, with English summary ⅓ p.]

Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 57-62, illus.

When used on summer chrysanthemums vinyl mulching advanced the date at which flowering started by 5 days and the peak period of flowering by 7–10 days. It also increased soil moisture. Tomatoes, especially the variety "Shinsei", also responded appreciably to mulching.

3864. Dimock, A. W.

More about chrysanthemum ray blight.

Bull. N.Y. St. Flower Grs, 1959, No. 160, p. 4.

Further control measures for the control of *Mycosphaerella ligulicola* are given [see *H.A.*, 29: 1678]. Sprays of zineb and captan were effective when applied during flower development. Their use does not, however, obviate the need to spray against *Septoria* leaf spot.

3865. Yamada, S.

Experiments on the epidemiology and control of chrysanthemum white rust, caused by *Puccinia horiana* P. Henn. [Japanese, with English summary ⅓ p.]

Reprinted from *Ann. phytopath. Soc. Japan*, 1956, **20**: 148-54, bibl. 13, illus., as *Mem. nat. Tōkai-Kinki agric. Exp. Stat., hort. Div.*, **19**, [received 1959].

The germination of the teleutospores was effectively inhibited by sodium pentachlorophenate, wettable sulphur and flowers of sulphur, whereas ammonia bordeaux, a copper-mercury fungicide, mercury fungicide and lime-sulphur had little effect. Wettable sulphur was also the most efficient inhibitor of the germination of the sporidia, with flowers of sulphur and Ceresan-lime slightly less so. Phygon, SR-406 and lime-sulphur also proved toxic to the fungus. Dusting with wettable sulphur is recommended.

3866. Maljutin, N. T.

Methods of changing the colour of flowers. [Russian.]

Priroda, 1959, **48**(4): 110-11.

Flower pigments are discussed, and the history of attempts to produce red garden forms of delphinium is briefly reviewed. It is suggested that red garden delphinium might be produced by increasing the flower size of the red *Delphinium nudicaule* through X-ray treatment of the seeds.

3867. (Dimock, A. W.)
Effective control of geranium diseases.
Nassau County agric. News, reprinted in *Flor. Exch.*, 1959, **132**(14): 15.

Captan mixed with the propagating medium or potting soil, at ¼ lb. of 50% captan/cu.yd. of soil, gives good control of *Pythium*. Sanitary measures for controlling *Botrytis* are also mentioned.—Cornell Univ.

3868. Garthwaite, J. M.
Observations on gerbera growing.
Exp. Hort., 1959, No. 2, pp. 12-15.

Results from an unheated Dutch-light structure showed that gerberas (planted at 15 in. square) like an organic soil with a high nitrate content and will tolerate lime in the soil. In a nutrition experiment plants grown in an alkaline compost produced the lowest number of flowers. Magnesium increased flower production when K and P were absent, but had no effect when they were present. Stem length was slightly increased by a combination of Mg and nitrate. Comparison of strains showed that American strains were superior to the commercial stock available in Britain. Seed sown immediately after harvest gave 90% germination, but this dropped to 50% after 6 months' storage.—Luddington exp. Hort. Stat.

3869. Kirchner, H.-A.
Die Einwirkung eines quecksilberhaltigen Desinfektionsmittels auf Gloxinien (Sinningien). (**The effect of some mercurial disinfectants on gloxinias.**) [Russian and English summaries 11 and 6 lines.]
NachrBl. dtsch. PflSchDienst, Berlin, 1959, **13**: 55-6, illus.

Pots containing gloxinia plants were placed on glasshouse benches covered with a layer of peat, which had been treated with the mercurial disinfectant Ceresan. The continuous uptake of water by the plants from the treated peat caused severe injuries to buds and flowers.—Inst. Phytopath. PflSch. Univ. Rostock.

3870. Wellensiek, S. J.
Vernalization and age in *Lunaria biennis.*
Reprinted from *Proc. kon. ned. Akad. Wetensch., Ser. C*, 1958, **61**: 561-71, bibl. 6, illus.

Lunaria biennis is a typical biennial, requiring vernalization before flower initiation can take place. When cold treatment at 6–8° C. was given for 12 to 19 weeks, flower formation was induced, provided the plants were adult (10 weeks old) at the start of the treatment. In the transition stage between the juvenile and adult phases (6–10 weeks old) the percentage of flowering increased, and the time required for budding decreased with increasing age. Seed vernalization did not result in complete induction, but it did supplement incomplete plant vernalization. It is argued that *Lunaria biennis* has no qualitative juvenile phase for cold-induction, but that the amount of "substrate" present in juvenile plants is limiting for complete induction. Gibberellin did not affect flower formation in *Lunaria biennis.*—Lab. Tuinbouwpl., Wageningen.

3871. Aarts, J. F. T.
Influence of α-naphthyl acetic acid, sucrose, and boric acid on the flower drop of *Lupinus polyphyllus* Ldl.
Reprinted from *Proc. kon. ned. Akad. Wetensch., Ser. C*, 1958, **61**: 325-33, bibl. 28, illus.

When sucrose was added to the water in which cut stems of blue- and white-flowered lupins were placed, concentrations of 6–8% prevented flower drop and concentrations of 3–4% increased the beneficial effect of dipping the stems in 0·05% NAA solution. Boric acid at 0·1% also prevented flower drop, and the addition to it of 2% sucrose prolonged the life of the flowers to 10–14 days. Existing theories are not considered to offer a satisfactory explanation of these results.—Lab. Tuinbouwpl., Landbouwhogesch., Wageningen.

3872. Saito, K.
Studies on the value and seed production of autotetraploid flowers. (I) A new strain of giant double-flowering petunias with special reference to genetical and environmental effects on fertility. [Japanese, with English summary ⅔ p.]
J. hort. Ass. Japan, 1959, **28**: 45-51, bibl. 7, illus.

Genetical aspects of induced autotetraploidy in petunias are discussed with reference to the production of double strains. Salmon flower colour was probably recessive against other colours. Seed production in induced autotetraploids was about 10% of that in ordinary diploids. Pollen and seed fertility of autotetraploids was highest in plants kept at about 27–31° C.

3873. Piringer, A. A., and Cathey, H. M.
Changing the flowering time and growth habit of petunias.
Flor. Exch., 1959, **132**(23): 12, 38, bibl. 5, illus.

Petunias grown in days of 10 hours or less were branched with short internodes, and their flowering was delayed. In longer days the plants had single stems with long internodes and flowered early. In long days provided by incandescent light the plants flowered earlier, and had longer internodes, than plants grown under fluorescent light. Branched plants with delayed flowering developed in long days at night temperatures as low as 50° F. The higher the night temperature, the longer were the internodes and the earlier the flowering for any given day-length. The compound 2,4-dichlorobenzyltributylphosphonium chloride inhibited internode elongation in relation to its concentration in the soil, but had no effect on branching or flowering.—U.S.D.A., Beltsville, Md.

3874. KAWAI, H.
Effects of pinching on flowering and fruiting habits of *Vinca rosea*. [Japanese, with English summary ¼ p.]
J. hort. Ass. Japan, 1959, **28**: 65-70, bibl. 5, illus.

The sequence of flowering was studied on shoots of annual *Vinca rosea* var. Kermesiana. Twice as many flowers were produced on pinched plants as on unpinched plants, and the succession of anthesis was more uniform. Seed could be harvested from flowers which opened in early September or earlier, and pinching enabled more seed to be collected at one harvest.

3875. JUSUFOV, A. G.
Variations in phlox plants obtained from roots of different ages. [Russian.]
Fiziol. Rast., 1959, **6**: 216-19, bibl. 8, illus.

Vegetative progeny from the old part of the root system flowered earlier during the first year than similar plants from young roots. Leaf cuttings taken from plants grown from young roots rooted better and developed a more vigorous root system during 2 successive seasons than those taken from plants grown from old roots.

3876. ROBERTS, E. P.
Effect of several growth regulators on growth and development of *Saintpaulia*.
Diss. Abstr., 1959, **19**: 3079, being *L.C. Card No. Mic.* 58-5313 of 82 pp.

The rooting of leaf-petiole cuttings from control plants was generally better than that of cuttings from plants which had been treated with 3 sprays of MH, IAA, TIBA or GA. Pollen germination of Star Girl Seedling plants was inhibited by chemical sprays. Plants of Queen's Cushion produced more flowers after GA treatment than after treatment with other chemicals or no treatment. Star Girl Seedling treated with GA showed no significant increase in flower number over control plants, but there was an increase in comparison with IAA- and IBA-treated plants. With both varieties the number of peduncles per plant was significantly greater for the GA-treated group than for all other groups. Flowers from untreated plants of Queen's Cushion lasted significantly longer than those from any other group, whereas flowers of Star Girl Seedling lasted longer after IAA treatment. Following the application of 100 p.p.m. GA plants of both varieties showed changes in leaf shape, elongation of petioles, peduncles and leaf blades, and an upward movement of leaves toward the vertical axis of the plant. Plants of Star Girl Seedling also showed changes in style position and shape, separation of anthers, and a tendency to greater production of peloric flowers.—Mich. St. Univ.

3877. FLINT, H. L.
Effects of supplementary illumination on the growth of winter snapdragon (*Antirrhinum majus* L.).
Diss. Abstr., 1959, **19**: 2208-9, being *L.C. Card No. Mic.* 59-446 of 140 pp.
FLINT, H. L., AND ANDREASEN, R. C.
Effects of supplementary illumination on the growth and time of flowering of snapdragon *Antirrhinum majus* L.).
Proc. Amer. Soc. hort. Sci., 1959, **73**: 479-89, bibl. 8.

Snapdragon seedlings (varieties Jackpot and Margaret) were illuminated at night by incandescent or mercury vapour lamps, using various methods, before benching in the greenhouse. The use of incandescent lamps resulted in the earliest flowering but caused a considerable reduction in plant size. Mercury lamps resulted in less rapid flowering but less reduction in size. The percentage dry weight was not affected by lighting but was greatly affected by the time of year. Light of very low intensity (produced by a 60-watt incandescent lamp 40 in. above the seedlings) was in some cases very effective in hastening flowering, but this effect was quite erratic. The maximum advance of flowering obtained was about 7 weeks. This was achieved with plants raised from seed sown in late August. Progressively less advance of flowering occurred with later sowings. Pinched plants responded less to supplementary illumination than single-stemmed plants. The effect of illumination was never so great as were the effects of seasonal changes in light and temperature. [See also *H.A.*, 28: 2883.]—Cornell Univ., Ithaca, N.Y.

3878. BRIAN, P. W., HEMMING, H. G., AND LOWE, D.
The effect of gibberellic acid on shoot growth of Cupid sweet peas.
Physiol. Plant., 1959, **12**: 15-29, bibl. 7.

The total stem length, in main axis and branches, of Cupid sweet peas was increased by gibberellic acid (GA) treatment. The effect of 10 weekly applications of 1 μg. GA was much greater than that of a single initial dose of 10 μg., and nearly as great as that of an initial 100 μg. dose. The total number of internodes formed was not increased; an initial dose of 100 μg. GA significantly reduced the total number of internodes formed. At first all GA treatments inhibited branch formation and extension. Subsequently only two treatments influenced the number of branches formed; an initial 100 μg. dose reduced branching, and weekly applications of 1 μg. GA increased the number of branches. Nevertheless, all GA treatments simplified the branching system and directed a greater proportion of the growth into the main axis. Consequently the plant habit was much modified. Untreated plants were short and highly branched, with secondary and tertiary branches developing on the main branches. A single 100 μg. dose of GA directed growth into a main axis and two long branches arising from nodes 2 and 3 of the main axis. Weekly treatment with 1 μg. GA confined growth almost exclusively to the main axis. All GA treatments, but particularly a single 100 μg. dose and weekly doses of 1 μg., increased mean leaf size, though the total leaf area of a plant was only transiently increased. GA treatment slightly delayed the opening of flowers. Weekly application of 1 μg. GA increased the number of flower buds visible on the two occasions when counts were made. All GA treatments increased the number of seeds produced and increased mean seed-weight. Possible causes of this increased seed yield are discussed. [Authors' summary.]—I.C.I. Ltd., Akers Res. Lab., Welwyn.

Bulbs, tubers, etc.

(*See also* 3184, 3671, 3942c, l, y, 3943j, 4162s.)

3879. Veerman, J. A.
Ervaringen met bollenoogsters. (**Experience with bulb harvesters.**) [English summary 6 lines.]
Meded. Dir. Tuinb., 1959, **22**: 164-6.

A prototype bulb harvester with a vibrating scoop worked fairly well in sandy and dry clay soils, but the separation of the soil from the bulbs was not entirely satisfactory.

3880. Fowden, L., and Bryant, M.
Nitrogenous compounds and nitrogen metabolism in the Liliaceae. 4. Isolation of azetidine-2-carboxylic acid and evidence for the occurrence of αγ-diaminobutyric acid in *Polygonatum*.
Biochem. J., 1958, **70**: 626-9, bibl. 21.

Full details are given of the paper chromatographic technique used to isolate these two compounds from the rhizomes of Solomon's seal, *P. multiflorum*. The former accounted for about three-quarters of the non-protein nitrogen fraction of the tissue, and the latter is considered to be its precursor. [For part 3 see *H.A.*, 27: 3764.]—Univ. Coll., London.

3881. Fowden, L., and Bryant, M.
Nitrogenous compounds and nitrogen metabolism in the Liliaceae. 5. The metabolism of azetidine-2-carboxylic acid.
Biochem. J., 1959, **71**: 210-17, bibl. 15, illus.

An attempt was made to trace the metabolism of A-2-C by feeding *Convallaria majalis* and *Polygonatum multiflorum* with CO_2 and a number of simple organic compounds containing C^{14}. The slow rate of increase of radioactivity in this acid indicated only a distant relationship to the primary photosynthetic products and a similarity to alkaloid synthesis. Contrary to expectation neither labelled glucose, γ-amino-butyric acid, nor αγ-diaminobutyric acid produced activity in A-2-C.—Univ. Coll., London.

3882. Fowden, L.
Nitrogenous compounds and nitrogen metabolism in the Liliaceae. 6. Changes in nitrogenous composition during the growth of *Convallaria* and *Polygonatum*..
Biochem. J., 1959, **71**: 643-8, bibl. 13.

The total N, 75% ethanol-soluble N, and certain amino and imino acids were estimated in samples from the roots, rhizomes and shoots of *C. majalis* and *P. multiflorum* taken in early February, mid-April, late May and August. The ratio of soluble to total N was found to be high at all times in both plants, and the amount of azetidine-2-carboxylic acid (A-2-C) very high, being more than 50% of the total nitrogenous matter in *Polygonatum*. In both plants the concentration of this acid was much greater in the shoots when young than when mature. It is suggested that the roots are the main seat of A-2-C synthesis in *Convallaria*.—Univ. Coll., London.

3883. Doorenbos, J.
Bloemgrootte bij cyclamen. (**Flower size in cyclamen.**) [English summary $\frac{1}{3}$ p.]
Meded. Dir. Tuinb., 1959, **22**: 199-206, bibl. 12, illus.

No genetical relationship was found between flower size (length of petal), chromosome number and flower colour in 191 cyclamen varieties. A diploid, white variety had the longest petals. Petal length and width varied in cultivars of the same colour but of different origin. The character "large petals" is probably determined by a large number of recessive genes, and this may explain why the longest petals occur in the widely-grown diploid variety.—Lab. Tuinbouwpl., Wageningen.

3884. Fairbank, H., and Sheard, G. F.
Cyclamen: effects of different methods of planting.
Exp. Hort., 1959, No. 2, pp. 8-11.

In a preliminary trial flowering was delayed by burying cyclamen corms completely at the final potting. In further trials, made at 2 centres to compare potting techniques, there were indications that an intermediate potting (into 3½-in. pots), as well as burying the corms, resulted in later flowering and greater leaf production.—Luddington and Fairfield exp. Hort. Stats.

3885. van Bragt, J.
Flower colour pigments in cyclamen.
Reprinted from *Proc. Kon. ned. Akad. Wetensch., Ser. C*, 1958, **61**: 448-53, bibl. 10.

Paper chromatographic separation of extracts from the flowers of 184 plants of *C. persicum* confirmed that the pigments therein were rhamnoglucosides and diglucosides of malvidin, cyanidin and paeonidin. Paeonidin-3-glucoside and possibly cyanidin-3-glucoside were also found. Most of the flowers contained a series of pigments in varying proportions, and all, save those from a single plant, contained malvidin glucosides.—Lab. Tuinbouwpl., Landbouwhogesch., Wageningen.

3886. Bar-Sella, P.
Causes of rapid wilting of cut dahlias and means to improve their keeping qualities.
Bull. Res. Coun. Israel, Sect. D, 1959, **7D**: 35-8, bibl. 5.

Cut dahlias have a rather short storage life, corresponding to the relatively short life of the inflorescences blooming naturally on the mother plant. Two days after picking, uptake of water is impeded by plugs originating in the xylem vessels. Bacterial infections, affecting keeping qualities adversely, are not of primary importance, since antibiotics increase storage life only by about one day. Treatments reducing the respiration rate, such as dipping the stems in maleic hydrazide (50 p.p.m.), increase storage life by about the same period. [From author's abstract.]—Hebrew Univ., Rehovot.

3887. Tsukamoto, Y., and Yagi, M.
Dormancy of gladiolus corms. (V) Fluctuation of auxin and inhibitor contents in gladiolus corms. [In English.]
J. hort. Ass. Japan, 1959, **28**: 59-64, bibl. 12.

Auxin (IAA) was detected in the corms of normally-growing plants; it disappeared after harvest, but appeared again in corms stored at room temperature for 2 months. The auxin inhibitor content in growing corms was low, but started to increase at harvest time reaching a maximum after a month's storage, after which it gradually decreased. High temperature treatment followed by cool storage of corms accelerated the appearance of auxin. The fluctuation of auxin and inhibitor was related to the degree of dormancy. [For part IV, see *H.A.*, 29: 719.]—Kyoto Univ.

3888. Apte, S. S.
Kieming van gladiolekralen. II. (**Sprouting of gladiolus cormels. I.**) [English summary 17 lines.]
Meded. Dir. Tuinb., 1959, **22**: 207-11, bibl. 17, illus.

A pre-planting storage temperature of 3°–9° C., after 4 months at 5–10° C., promoted germination in cormels of 6 gladiolus varieties. Sprouting was reduced at 15° C., and was significantly reduced at 20° C. At 23°–30° C. sprouting was stimulated in some varieties, but not in others. In March the variety Afrika did not respond to cracking or to low temperature, but in June it was sensitive to both treatments. [For part I see *H.A.*, 29: 1701.]—Lab. Tuinbouwpl., Wageningen.

3889. Jenkins, J. M., Jr.
Brown tip of glads due to waterlogging.
Flor. Exch., 1959, **132**(15): 16, illus.

Tip die-back of gladiolus leaves occurred after heavy rain in poorly-drained soil areas. Flower production, however, was only affected when severe root injury occurred.—N.C. agric. Exp. Stat.

3890. Halevy, A. H.
Irises from Israel for early forcing.
Flor. Exch., 1959, **132**(17): 12-13, bibl. 3, illus.

The response of Israel-grown Wedgewood iris bulbs to early forcing at Beltsville in the U.S.A. was generally similar to that of bulbs from the Pacific Northwest. Bulbs sprouted earlier after storage at 50° and 55° F. than after storage at 65° F. Continuous storage at 65° F. was harmful, and the bulbs which did sprout produced plants of little commercial value. Heat curing for 10 days at 90° F. had the best effect on large bulbs (10–11 cm.), which were then stored at 55° F. for 6 weeks before forcing. Results after storage at 50° F. were very variable. The highest percentage of flowering and the longest stems were produced by bulbs 10–11 cm. in size; 8–9 cm. bulbs were too small for satisfactory forcing. Bulbs stored at 55° F. flowered earlier than those stored at 50° F., in spite of the latter's earlier emergence.

3891. Ueno, K., and Fukase, M.
The growth of and the influence of nitrogen fertilizer on *Lilium speciosum*. [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 63-8, illus.

The rate of increase of N in the root was found to parallel that in the shoot; little P was absorbed, but the uptake of K rose rapidly to a maximum in July and August. The plants grew best with minimal or nil applications of fertilizer. Seasonal changes in the growth of bulbs and bulblets are also described.

3892. Shanks, J. B., and Link, C. B.
Leaf scorch of the Croft lily.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 503-12, bibl. 16.

Under conditions of high N fertilization, leaf scorch of Croft lilies was reduced by raising the soil pH. The addition of Ca always reduced the amount of leaf scorch. In acid soil the application of high rates of N or P singly resulted in increased leaf scorch, but when both elements were added this was not always the case. A high level of N reduced leaf scorch in limed soils or in low acidity soils with Ca present. Low levels of N and P were associated with a yellowing and browning of the lower leaves. There appeared to be no direct relationship between leaf scorch or breakdown of the lower leaves and leaf concentrations of N, P, K, Ca or Mg. It is concluded that liming and regular fertilization, particularly with N and P, are useful as a means of controlling both typical leaf scorch and breakdown of the lower leaves of Croft lilies. [For a preliminary account see *H.A.*, 29: 2762.]—Univ. Md, College Park.

3893. DOUCETTE, C. F.
Soil drenches for control of the narcissus bulb fly.
J. econ. Ent., 1959, **52**: 348, bibl. 3.

A single drench application of aldrin at 2 lb. or of heptachlor or Diptrex at 1 lb. per 100 gal., directed at the neck of narcissus plants gave very good protection against *Lampetia equestris*, when applied at the start of adult activity. The volume of water needed would make the method impracticable for large-scale use, but suitable for valuable material and especially for gardens where the bulbs are not lifted each year.—Agric. Res. Serv., U.S.D.A.

3894. CARRA, P., AND VIEL, P.
Amélioration de la croissance du *Strelitzia reginae*. (**Improving the growth of *Strelitzia reginae*.**)
Rev. hort. Algér., 1958, **62**: 691-9, illus.

The following conditions appeared to be optimal for the growth of *Strelitzia* seedlings: sowing in heat in a pan containing sand and sphagnum; potting up after the appearance of the first leaf; then 6 months after emergence, planting out in soil in a heated frame, at least 80 cm. apart; heating during the winter and shading and syringing during the summer.

3895. HAGIYA, K., AND AMAKI, W.
Studies on offsets of tulip bulbs. (II) Development and morphology of offsets in small bulbs.
[Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1959, **28**: 52-8, bibl. 9, illus.

In bulbs likely to form an offset, it was apparent in December (2 months after planting) that the growing point was situated to one side of the central axis of the bulb. The development of an offset is described in detail with the aid of illustrations. [For part I, see *H.A.*, 28: 1732.]

3896. SLOOTWEG, A. F. G.
Zure tulpen. (***Fusarium oxysporum* on tulips.**)
Weekbl. Bloembollcult., 1959, **69**: 873-5.

Data presented show that tulip infection by *Fusarium oxysporum* can be reduced by bulb disinfection before planting, by lifting bulbs at the right time (infection increases with delay), by drying the bulbs fairly quickly before storage, by cleaning the bulbs when dry, and by providing adequate ventilation during storage.—Lab. BloembollOnderz., Lisse.

Lawns and sports turf.

(*See also* 3723b, 3942x, 3943e, g, h, l.)

3897. BRADSHAW, A. D.
Studies of variation in bent grass species, I. Hybridization between *Agrostis tenuis* and *A. stolonifera*.)
J. Sports Turf Res. Inst., 1958 (issued 1959), **9**: 422-9, bibl. 10, illus.

The natural hybridization between *Agrostis tenuis* and *A. stolonifera*, which occurs in Britain, may have considerable significance in sports turf management. Preliminary trials suggest that, compared with *A. stolonifera*, in which interest has mainly centred hitherto, some hybrid clones form a considerably closer turf, can grow under poorer conditions, have a pleasanter dark green colour and show better rooting and rhizomatous growth, although they are not quite so low-growing and tend to be a little tufted.—Univ. Coll. N. Wales, Bangor.

3898. JACKSON, N.
Seed dressing trial, 1958.
J. Sports Turf Res. Inst., 1958 (issued 1959), **9**: 455-8, bibl. 1, illus.

A trial was laid down in September 1958 to determine whether *Fusarium culmorum* inoculum applied in March, June and September 1957 was still active, and to observe the effect on the establishment of S23 perennial ryegrass, S50 timothy and New Zealand chewings' fescue of Fernasan (TMTD) at 0·5% and Orthocide (75% captan) at 0·5 and 0·25%. Ryegrass showed no significant difference in establishment between inoculated and non-inoculated areas and no benefit from the seed dressings. Residual effects of the inoculation were, however, apparent from the significantly reduced establishment of S50 timothy and chewings' fescue, except where seed of the latter had been treated with 0·5% Orthocide.

3899. SMITH, J. D.
The effect of lime application on the occurrence of *Fusarium* patch disease on a forced *Poa annua* turf.
J. Sports Turf Res. Inst., 1958 (issued 1959), **9**: 467-70, bibl. 5.

The application of lime at rates ranging from 2 to 16 oz. per sq. yd. greatly increased the incidence of *Fusarium* patch disease (*F. nivale*). Increased susceptibility persisted as long as the pH of the surface ½ in. remained raised, namely, for about a year with the 2 oz. application and for longer periods with the higher rates.

3900. JACKSON, N.
Ophiobolus patch disease fungicide trial, 1958.
J. Sports Turf Res. Inst., 1958 (issued 1959), **9**: 459-61.

PP Liquid Mercury Plus and Verdasan, both organo-mercury compounds, gave the best results in a trial with 8 fungicides for the control of *Ophiobolus* patch disease (*O. graminis* var. *avenae*) on bent turf (*Agrostis tenuis*). For example, Verdasan, which was applied at 5·6 g. per 900 ml. water per 36 sq. ft. three times between 11 August and 12 September, reduced the percentage area attacked from 30·5 on 11 August to 2·5 on 26 September.

3901. JEFFERSON, P.
Studies on the earthworms of turf. C. Earthworms and casting.
J. Sports Turf Res. Inst., 1958 (issued 1959), **9**: 437-52, bibl. 12, illus.

The main object of the study described here was to obtain information on the amount of soil thrown on the surface of turf in the form of worm casts and on the effect of climatic conditions on casting. A preliminary study was also made of the Ca level and reaction of casts from known environments, and pot experiments were carried out to determine the behaviour of different species of earthworm. Among the findings were that 3 out of 10 earthworm species made surface casts and that extensive burrowing and heavy casting may be a response to poor and acid nutritive conditions.

3902. LICHTENSTEIN, E. P., AND POLIVKA, J. B.
Persistence of some chlorinated hydrocarbon insecticides in turf soils.
J. econ. Ent., 1959, **52**: 289-93, bibl. 15.

To determine the residual effectiveness of some chlorinated hydrocarbon insecticides for the control of Japanese beetle grubs (*Popillia japonica*), turf plots were top dressed with various concentrations of chlordane and BHC in 1946, of heptachlor in 1949 and of aldrin in 1954. An average of 15% of the applied chlordane was recovered from the upper 3 in. soil layer 12 years after treatment as estimated by chemical analysis, and 12% as estimated by bioassay. Eleven years after treatment 41% of the applied BHC was recovered as estimated by chemical analysis, and 8% as measured by bioassay. No heptachlor was recovered 9 years after treatment when analysed by a colorimetric method, but a bioassay procedure showed 4–5% of a toxicant which proved to be heptachlorepoxide. Most of the aldrin had disappeared after 4 years; part of it, however, was converted into dieldrin, which was recovered to an extent of 8–10% of the applied dosage. Where aldrin was rototilled into the soil, it persisted considerably longer, though the rate of dieldrin formation was similar to that in soils which were not rototilled.—Ohio and Wis. agric Exp. Stats.

Orchids.

(*See also* 3854, 4135.)

3903. DOWNIE, D. G.
Rhizoctonia solani and orchid seed. The mycorrhiza of _Orchis purpurella_.
Trans. bot. Soc. Edinb., 1959, **37**: 279-85, bibl. 4, and 1959, **38**: 17-29, bibl. 11, illus.

Proof is submitted that *Rhizoctonia* (*Corticium*) *solani* is a frequent endophyte in the roots of *Orchis purpurella*, and is an accepted symbiont at seed germination. In further tests 6 other orchids (including a cultivated hybrid) reacted favourably to one or more of the experimental strains of the fungus.—Univ. Aberdeen.

3904. GÄUMANN, E., AND KERN, H.
Über die Isolierung und den chemischen Nachweis des Orchinols. **(On the isolation and determination of orchinol.)**
Phytopath. Z., 1959, **35**: 347-56, bibl. 3, illus.

A method is described of isolating and identifying antibiotics and other interesting substances from tubers of *Orchis militaris*, in which resistance to infection has been activated by fungal inoculation. Qualitative and quantitative methods are described for estimating orchinol. [Authors' summary.]—Inst. spez. Bot., Eidg. tech. Hochsch., Zürich.

3905. GÄUMANN, E., AND KERN, H.
Über chemische Abwehrreaktionen bei Orchideen. **(Chemical defence reactions in orchids.)** [English summary pp. 1⅔.]
Phytopath. Z., 1959, **36**: 1-26, bibl. 20.

Whereas the roots of many orchids are regularly invaded by mycorrhizal fungi, the bulbs rarely show such an association, and in these rare instances only limited areas are affected. As a result of infections by *Rhizoctonia repens* the bulbs of *Orchis militaris* regularly form several substances. Among these are *p*-hydroxy-benzylalcohol and orchinol. Neither substance has been found in healthy bulbs. The antibiotic activity of *p*-hydroxybenzylalcohol is slight, and its role in the resistance-metabolism of the orchid bulb is not yet clear; however, it may be a precursor of orchinol. By contrast, orchinol possesses a strong fungistatic activity against *Rhizoctonia repens*. The activity of orchinol is relatively wide and non-specific; thus the first infection which initiates its production protects the tissue, not only against homologous reinfections, but also against a whole series of secondary parasites and saprophytes. Orchinol persists for months in the infected bulb tissues. It is suggested that orchinol, by reason of its method of production and functional importance, should be defined as a genuine induced antibody. To do so, the classical medical definition of antibodies must be broadened. An antibody in the biological sense would, therefore, be defined as a specific substance that is created by the host in reply to an infection and that in turn acts against the pathogen which has initiated its elaboration. [From authors' summary.]— Inst. spez. Bot., Eidg. tech. Hochsch., Zürich.

Succulents.

(*See also* 3848.)

3906. Kemmerer, J. B.
The cactus.
World Crops, 1959, **11**: 188-9, 192, illus.

The centre of the world's cactus industry is California and Texas where some 30 companies now produce cacti and other succulents on a commercial scale in gardens of up to 15 acres. A brief account is here given of multiplication from seed, which is mainly derived—not without difficulty owing to the explosive character of the fruits—from cacti grown in the gardens. The seed must be sown in fumigated or heat-treated soil to prevent loss due to pests, diseases and weeds, and the seed boxes must be kept in a greenhouse at a temperature of 70° F. By the time seedlings are of marketable size they will have been transplanted three times. In their youth and for satisfactory development they may need daily or even half-daily watering. All ground used by the growers for cacti is fumigated, generally with methyl bromide, before planting.

3907. Rünger, W.
Über den Einfluss der Temperatur und der Lichtintensität auf die photoperiodische Reaktion und die Blütenentwicklung von *Kalanchoe blossfeldiana* cv. Tom Thumb (IV). **(On the effect of temperature and light intensity on the photoperiodic reaction and flower development of *Kalanchoe blossfeldiana* var. Tom Thumb. IV.)**
Gartenbauwiss., 1958, **23**: 419-32, bibl. 5, illus.

In these experiments the temperature was varied, while different day lengths and permanent darkness were provided after the inductive short-day period. An increase in the temperature reduced the flowering impulse, the effect on number of flowers and type of foliage lasting longer than that on number of lateral shoots with inflorescences. The influence on the latter was confined to about 10 days. At temperatures of 30° C. and above short days (after an inductive period at lower temperatures) inhibited flowering less than did long days. In permanent darkness, after an inductive short-day period, the flowering impulse decreased with rising temperature. Long days had an inhibiting action in comparison with permanent darkness, the intensity of this inhibition varying with the temperature and decreasing with rising temperature. It is suggested that temperature affects the action of long days and of at least one other process which is independent of light. Finally the results of parts I to IV [*H.A.*, 27: 714 and 29: 1730] are summarized as a whole.—Inst. ZierpflBau, tech. Hochsch., Hannover.

3908. Schwemmle, B., and Lange, O. L.
Endogen-tagesperiodische Schwankungen der Hitzeresistenz bei *Kalanchoe blossfeldiana*. **(Endogenous diurnal variations in the heat resistance of *Kalanchoe blossfeldiana*.)**
Planta, 1959, **53**: 134-44, bibl. 43.

Under conditions of constant temperature and humidity medium-sized, but not fully grown, leaves of the short-day plant *Kalanchoe blossfeldiana* show endogenous, diurnal variations in heat resistance. In a 12-hourly alternation of light and darkness the resistance to very high temperatures decreases before the beginning of the light period, reaching its minimum approximately in the middle of the light period; from then onwards heat resistance increases to reach a maximum approximately in the middle of the dark period. If the plants are then transferred to permanent darkness this periodicity continues for at least 48 hours, though with reduced emphasis. The growing point and youngest leaves, as well as fully grown and ageing leaves, are considerably more resistant to heat, showing no distinct diurnal rhythm in their sensitivity to very high temperatures. These results are discussed in relation to other endogenous rhythms found in *K. blossfeldiana*.—Univ. Göttingen.

Roses.

(*See also* 3942r.)

3909. Thomae, K.
Bericht über die Jahresarbeit der Rosenprüfer 1957-1958. **(Annual report of the rose trials for 1957-58.)**
Dtsch. Baumsch., 1959, **11**: 103-7.

The following new rose varieties were subjected to final tests in 6 localities: Two tea and hybrid tea varieties, 34 polyantha, hybrid polyantha and floribunda varieties, and 8 climbing varieties. Thirty-four new varieties were subjected to preliminary tests. In each case a brief description and the name of the breeder is given.

3910. Meyer, E.
Rosa multiflora als Unterlage. (***Rosa multiflora* as a rootstock.)**
Gartenwelt, 1959, **59**: 245-7, bibl. 3.

Preliminary selection of *R. multiflora* seedlings in South Africa has produced 4 clones which are considered to be worthy of further trial. Cut flower yields of 5 rose varieties on 3 of the clones are compared.

3911. Toy, St. J.
Effects of paraffin waxes on growth and physiology of rose plants.
Diss. Abstr., 1959, **19**: 2209-10, being *L.C. Card No. Mic.* 59-1149 of 120 pp.

The growth and flowering of rose bushes, treated while dormant with one of two types of wax, was 50% greater than that of untreated bushes. In a storage experiment with controlled humidities waxed plants again made significantly more shoot and root growth than unwaxed, regardless of the storage humidity (100%, 75% and 50%). However, mould development was greater at the higher humidities, die-back was greater in hot-water treated (but not waxed) plants and at the lower humidities, and the moisture contents of canes were slightly less at the lower humidities (except for waxed plants). Unwaxed stems of althea, privet and rose lost almost all their moisture within 4 days. Waxing the stem ends reduced moisture loss in althea and privet, but not in roses. When entire stem sections were waxed, moisture loss was considerably retarded but was still the most rapid in roses. Respiration of waxed stems was reduced to about 75% of that of untreated canes, but after removal of the wax coating respiration was higher than in untreated canes. Respiration was increased by hot-water treatment at 158°–180° F. but was reduced by treatments above 185° F. Stem tissue was not affected by waxing at temperatures up to 190° F., but canes dipped in hot water at this temperature showed collapse of epidermal, cortical and phloem cells, although the cuticle did not appear to be affected. No indications of wax penetration were observed. —Ia St. Coll.

3912. Langhans, R. W., and Leach, A. D.
Where does the greenhouse labor go?
Bull. N.Y. St. Flower Grs, 1959, No. 159, pp. 4-5.

In 12 glasshouses, belonging to 4 rose growers, cutting the flowers consumed an average of 41% of the total time spent in the houses. Time consumed in ventilating (average 8·8%) and watering (8%) showed a wide variation, and the use of automatic devices should reduce labour requirements. Fertilizing required 2·7% of the labour, but this cost could almost be eliminated by including it in the watering operation. Tying averaged nearly 20% of the labour, but this figure was much lower in houses where cross-wiring was used instead of staking. Pinching averaged 7·9% of the labour used. It is concluded that one man should be able to take care of about 1,000 rose plants per hour.

3913. Weinstein, L. H., Porter, C. A., and Laurencot, H. J., Jr.
Quinic acid as a precursor in aromatic biosynthesis in the rose.
Contr. Boyce Thompson Inst., 1959, **20**: 121-34, bibl. 32.

Changes in concentration of quinic, succinic and malic acids of Better Times rose petals were studied during aging on the plant. Quinic acid was found to increase in the bloom until the rose was half-opened, after which it decreased. Succinic acid increased until the blooms were half-opened, then remained at a constant level. Malic acid accumulated throughout the aging period. The ratio, malic/quinic, increased steadily with age until the concentration of malic acid in the tissues approached that of quinic acid. C^{14}-labeled quinic acid was biosynthesized in young rose leaves by exposing plants to $C^{14}O_2$ in the light. Aliquots of the labeled quinic acid were fed back to cut roses and allowed to be metabolized for various lengths of time. About 20% of the C^{14} fed into the roses was recovered as $C^{14}O_2$ by the time they were senescent. Shikimic acid was the major labeled compound of the nonvolatile organic acids. Tyrosine and phenylalanine represented the bulk of radioactivity of both free and protein amino acids. A major radioactive constituent was found in the neutral fraction, but was not identified. It is concluded that roses readily metabolize quinic acid and that the relatively high specific activities and high total counts found in shikimic acid, tyrosine and phenylalanine establish that this alicyclic compound can be a precursor in aromatic biosynthesis in the rose. [Authors' summary. For related work see *H.A.*, 28: 3967.]

3914. Prosser, M. V., and Jackson, G. A. D.
Induction of parthenocarpy in *Rosa arvensis* Huds. with gibberellic acid.
Nature, 1959, **184**: 108, bibl. 5.

Two hundred flower buds were emasculated on the bush, by cutting off the disk including the head of stigmas, and treated with 1·0% GA in lanolin. After 46 days 71% developed parthenocarpically compared with 45% for normally fertilized hips under field conditions. Untreated emasculated controls did not develop. In normal hips 2 acidic growth-promoting substances were found plus a neutral growth-promoting substance that was detected only in the bud and flowering stages. None of them was found in either the parthenocarpic or the emasculated hips, but a neutral growth-promoting substance was present in both.—Univ. Coll. N. Wales, Bangor.

3915. Lyle, E. W.
New sprays cut threat of black spot on roses.
Amer. Nurserym., 1959, **109**(10): 8, 73-5.

Captan, Phaltan and maneb sprays were more effective than dusts for controlling black spot, and also resulted in greater increases in plant weights. The residual effect of maneb was longest and was improved by adding Triton B-1956. Phaltan was also a possible fungicide for powdery mildew, but captan and maneb gave poor mildew control.—Texas Rose Res. Foundation Inc., Tyler.

3916. (Palmer, J. G., Henneberry, T. J., and Travis, R. V.)
New fungicides control black spot on roses.
Amer. Nurserym., 1959, **109**(10): 75.

In experiments with fungicide-insecticide combinations Phaltan and Cyprex were effective against black spot of roses. New rose growth in one season was stunted following the Cyprex combination spray. Zineb was considerably less effective in a combination spray than either Cyprex or Phaltan.—U.S.D.A., Beltsville, Md.

3917. Henneberry, T. J., Smith, F. F., and Taylor, E. A.
Control of two-spotted spider mites with chlorbenside, Ovex and Tedion.
J. econ. Ent., 1959, **52**: 342-3, bibl. 6.

When used in combination with a fungicide and insecticide plus a wetter, Tedion and Ovex [chlorfenson] gave better control of *Tetranychus telarius* on outdoor roses than did chlorbenside. On lima beans, when applied with the wetter only, Tedion was more effective than Ovex or chlorbenside. All treatments reduced mite populations and feeding injury well below those on the untreated plots.—Agric. Res. Serv., U.S.D.A.

Other trees and shrubs.

(*See also* 3162, 3942b, g, j, o, q, t-w, 3943b-d, k, m, 4132, 4134, 4143, 4157.)

3918. Lothian, T. R. N.
Native shrubs and trees for ornamental planting.
Reprinted from *Introducing South Australia* (Editor R. J. Best), 1958, pp. 106-10.

Among plants, the beauty of which is indicated by the author, are the acacias and eucalypts, the *Myrtaceae* including *Melaleuca* and *Callistemon* spp., native pines, viz. *Callitris* and *Casuarina*, 2 weeping trees, viz. *Acacia salicina* and *Pittosporum phillyreoides* with its cream coloured flowers and orange-yellow fruits, hopbushes, viz. *Dodonaea*, the banksias and hakeas, especially *Hakea multilineata* or grassleaf or bottlebrush hakea, the emu bushes, viz. *Eremophila* and the related genus *Myoporum*, *Phebalium*, *Correa* and *Olearia* spp., low growing woody plants such as *Eriostemon*, *Halgania*, *Hibbertia*, *Pimelea*, *Dampiera* and *Philotus*, and climbers such as the Australian tecoma and native lilac *Hardenbergia violacea*.

3919. Watkins, G. [R.].
Sowing seed in polythene bags.
E. Afr. agric. J., 1959, **24**: 197-202, bibl. 1.

This technique, which resembles the pre-germination of seed by stratification in sacks buried in moist sand, was described for coffee seed in *H.A.*, 29: 2959. In this article the advantages and disadvantages of the method are discussed, and the results are presented of its use with seeds of a number of tropical tree species, including several ornamentals. The pre-sowing treatments, duration and percentage of germination and other relevant data are tabulated.—Forest Dep., Tanganyika.

3920. Kelley, J. D.
Fertilization studies with container-grown nursery stock.
Amer. Nurserym., 1959, **109**(10): 12-13, 79-84, illus.

Urea-formaldehyde applications at planting and in mid-season supplied sufficient N to deciduous and evergreen nursery stock growing in containers, and their growth was similar to that of plants fertilized at 3-week intervals throughout the growing season. Potassium frit added to the soil at planting also maintained a supply of K that was adequate for good growth. Superphosphate (20%) was used as a slowly-available source of P. Shading the plants resulted in slightly increased growth of *Pyracantha coccinea lalandi* and *Ilex crenata convexa*, but *Berberis julianae* made 80% more growth in shade than in full sun.—Univ. Ky, Lexington.

3921. Holmes, F. W.
Bark-patch grafting over tree-pruning wounds.
Abstr. in *Phytopathology*, 1959, **49**: 227-8.

Decay has been commonly observed after prolonged exposure of wood in pruning wounds. If this wood is covered promptly with a layer of wound paint or of living marginal callus tissue, decay organisms are excluded. However, paints crack or peel, and callus growth is slow. In an effort to prevent entrance of fungi more effectively, patches of elm bark were grafted over pruning wounds in elm trees. Best results were obtained when (1) both patch and wound were shaped by cutting around the same spindle-shaped 20-gauge galvanized sheet-tin template, fitted to the tree, (2) the patch was first dipped in an aqueous solution containing 100 p.p.m. IAA, (3) the patch was applied with the same orientation in which it originally grew, and (4) mild pressure was applied over the surface of the patch. Where all of these conditions revailed, the patch tissues merged with the host issues around the entire periphery of the wound, nd the patch formed a layer of wood 2·5–4·5 mm. hick under its whole surface between June 20 and eptember 13. No evidence of decay was observed n this wood.

922. Williams, R. E., and Neiswander, R. B.
Investigations on control of the bronze birch borer and the flatheaded apple tree borer.
J. econ. Ent., 1959, **52**: 255-7, bibl. 4.

During 1956 and 1957 tests were conducted on the ontrol of the bronze birch borer, *Agrilus anxius*, vhich attacks birch trees, and the flatheaded apple ree borer, *Chrysobothris femorata*, a pest of many rnamental trees. Both species of borer were ffectively controlled with parathion. Results btained with DDT indicated that one application t a relatively high concentration, combined with liquid latex or polythene on the trunks of newly ransplanted trees may be adequate for the control f *C. femorata*.—Ohio agric. Exp. Stat., Wooster.

923. Gaud, S. M.
Control of the red-banded thrips, *Selenothrips rubrocinctus* Giard, on *Acalypha*.
[Spanish summary ¼ p.]
J. Agric. Univ. P.R., 1958, **42**: 258-62, bibl. 8, illus.

S. rubrocinctus was controlled by 2 or 3 fortnightly prays of BHC, endrin, DDT or aldrin at 1 pint f concentrated emulsion per 100 gal. water. The pest is described and some of its host plants amed.

924. North, C. P., and others.
Amelioration of virus symptoms in camellia with iron.
Virology, 1959, **8**: 131-4, bibl. 7, illus.

A graft-transmissible virus disease of camellias roduces yellow splotching and spotting of the eaves and white mottling of the coloured flowers. When infected plants growing in 3-gal. containers vere supplied with 1 g. of iron, chelated with thylenediamine di(orthohydroxy phenylacetate), heir leaves gradually became green and their lowers solid red or very nearly so. The response vas much slower than in the case of non-infected lants suffering from iron deficiency. When the ron supply was exhausted the virus symptoms eappeared.—Univ. Calif., Los Angeles.

925. (Paulus, A. O., and Raabe, R. D.)
Symptoms and control of camellia blight.
Flor. Exch., 1959, **132**(13): 43.

Camellia flowers infected with *Sclerotinia camelliae* hould be removed and burnt. A ground spray rogramme started between mid-December and mid-January with ferbam (76% at 6 lb. plus 1 to 4 oz. detergent per 1,000 sq. ft.) has given good ontrol of the fungus. Pentachloronitrobenzene at 2·5 lb. 75% w.p. per 1,000 sq. ft. has also given excellent control and should be applied at intervals of 15–20 days.—Univ. Calif., Riverside and Berkeley.

3926. Furman, T. E.
The root-nodules of *Ceanothus sanguineus* and *Ceanothus velutinus* and their relationship to the nitrogen nutrition of the plants.
Diss. Abstr., 1958, **19**: 1182, being *L.C. Card No. Mic.* 58-7312 of 56 pp.

Root nodules of *Ceanothus* are modified lateral roots, and no seasonal changes in gross aspect or morphology were seen. It is concluded that the nodule organism is a member of the Actinomycetales. Data from a field fertilization experiment indicated that N fixation occurs in *Ceanothus* nodules.—St. Coll. Wash.

3927. Thomson, B. F.
Bibliography on holly.
Bull. Holly Soc. Amer. **8**, 1955, pp. 36, bibl. 313, [received 1959].

The articles and books cited in this briefly annotated bibliography are intended as a key to published scientific information on *Ilex* species. There are also subject and author indexes. Among the headings are those on general culture and hardiness, varieties, commercial holly growing, propagation vegetatively and by seed, pests and diseases, taxonomy, ecology, botany, composition and yerba maté and other *Ilex* teas.—Conn. Coll., New London.

3928. Asen, S., Stuart, N. W., and Siegelman, H. W.
Effect of various concentrations of nitrogen, phosphorus and potassium on sepal color of *Hydrangea macrophylla*.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 495-502, bibl. 14.

Merveille and Monte Forte Perle hydrangeas were grown in quartz sand and supplied with varying concentrations of N, P and K. A low (28 p.p.m.) concentration of N, regardless of the P or K concentrations, produced undesirable mauve-coloured sepals. Plants supplied with medium (98 p.p.m.) or high (294 p.p.m.) N, high (42–47 p.p.m.) P and low (33–39 p.p.m.) K concentrations had pure red sepals. High (352–358 p.p.m.) K concentrations produced bicoloured, mauve and off-shade blue sepals. Differences in the N, P and K concentrations supplied to the plants had no effect on the anthocyanin (delphinidin-3-glucoside) concentrations in the sepals, but medium (98 p.p.m.) and high (294 p.p.m.) N concentrations slightly reduced the concentration of kaempferol in these tissues. Low (28 p.p.m.) N and high (352–358 p.p.m.) K concentrations supplied to the plants favoured Al and Mo accumulation in the sepals.

High (42–47 p.p.m.) P concentrations supplied to the plants reduced the accumulation of Al in the sepals. Differences in the colour of the sepals of these varieties were apparently due to the effects of the nutritional treatments on the absorption and accumulation of Al and Mo and not to the slight changes in the ratios of the concentration of kaempferol to delphinidin-3-glucoside. [From authors' summary.]—U.S.D.A., Beltsville, Md.

3929. POKROVSKIJ, E. A., AND SEDYH, A. S.
New organic phosphorus preparations—insecticides with systemic action.
VSb: Himija i Prim. fosfororgan. Soedinenij, M. AN SSSR, 1957, pp. 438-49, from *Ref. Ž. (Biol.)*, 1958, No. 7, Abstr. 30,567.

Seventy-six preparations in 0·25% concentration were tested in the laboratory against spider mites on hydrangeas. Acetylurea, ethyluretan and the preparations KFAN No. 6 (triethyldimethylamidmonothiopyrophosphate), No. 7 (tetramethyldiamiddiethylmonothiopyrophosphate) and Nos. 8, 11 and 13 were more effective than octamethyl [schradan?]. These 7 compounds were also used at 0·05, 0·1 and 0·25% concentrations against citrus red mite under natural conditions. Acetylurea and ethyluretan proved to be very efficient contact and systemic acaricides, and preparation No. 6 showed promise. Diethylphosphortrichlorethylisopropylphosphate was lethal to larvae of the tent caterpillar and tea moth.

3930. TRAYLOR, P. L.
Studies on the effect of floral initiation and development on rooting of cuttings of *Syringa vulgaris*, clons Charles Joly and Congo.
Diss. Abstr., 1959, **19**: 3080, being *L.C. Card No. Mic.* 59-1602 of 127 pp.

The transition from a vegetative to a generative status in the lilac shoot is described, with details of the development of the floral primordia. Floral initiation began 29–35 days after anthesis of flowers on the stock plants. The highest rooting percentages (96–100) were obtained with the first cuttings taken (in May), which were also physiologically the youngest cuttings. With subsequent batches of cuttings taken as the wood matured rooting gradually decreased. Rooting was low at or just before floral initiation, but increased during the stages of floral development. While rapid rooting of the cuttings was not associated with any specific size of cutting, longer cuttings in any specific sample were often slower to root than shorter ones. Length of day did not appear to have any effect on floral initiation or any significant effect on the rooting of cuttings. Cuttings with their terminal nodes removed usually did not root as well as did complete shoot cuttings. Certain variations in rooting could not be attributed to the effects of the physiological age of the cuttings or of floral initiation and development.—Ohio St. Univ.

3931. MULLIGAN, B. O.
Maples cultivated in the United States and Canada.
American Association of Botanical Gardens and Arboretums, 1958, 9 × 6 in., pp. 56, bibl. 33, illus.

The botany and nomenclature of maples naturally occupy an important proportion of this well-planned and well-produced booklet, and available information on hybrids and chromosome numbers is ably summarized. Useful lists of species are given for large shade trees, smaller ornamental trees, and trees with autumn foliage colours of red, red and yellow, orange, yellow and orange-brown. There is also a section, contributed by R. G. Coggeshall, on propagation, which describes the use of seeds, softwood cuttings in mist propagators or in plastic frames, grafting and budding.

3932. (COGGESHALL, —., DORAN, —., AND SNOW, —.)
Propagating *Acer* species by cuttings.
Flor. Exch., 1959, **132**(15): 28-30.

In rooting 8 species of *Acer* a quick-dip was combined with rooting under intermittent mist. Treatments of 10 mg./ml. and 20 mg./ml. IBA initiated roots on *Acer campestre* cuttings taken in May, June and July. Cuttings of *A. ginnala* taken from February to October rooted successfully with hormone-dip plus mist treatment; cuttings taken during April–July rooted prolifically with treatments of 20 mg./ml. IBA. *Acer palmatum* cuttings taken from April to July were rooted after treatment with 20 mg./ml. IBA; May and June cuttings provided the best percentages. Root initials were formed on *A. platanoides* cuttings taken in May and June; roots were formed after dips in 10 mg./ml. and 20 mg./ml. IBA solutions. With cuttings of *A. rubrum* rooting was only stimulated at 20 mg./ml. IBA; those taken during May, June and July rooted best, June cuttings rooting the quickest. Rooting percentages with *A. saccharum* cuttings after hormone treatment were 90% in June, and 92% in July; rooting was better with 20 mg./ml. IBA than with 10 mg./ml. April, May and June were the best months for rooting *A. saccharinum* cuttings, and the 20 mg./ml. IBA treatment gave the best results.

3933. GILL, D. L.
Wilt-resistant mimosa trees.
Nat. hort. Mag., 1959, **38**: 105-7, illus.

Two pink-flowered clones of *Albizzia julibrissin* (Tryon and Charlotte), are resistant to infection by *Fusarium oxysporum* f. *perniciosum*. For propagation root cuttings, 3–4 in. long, have given better results than stem cuttings.

3934. Bolli, M.
Sulla origine delle radici avventizie in talee di *Nerium oleander* L. e sugli stimoli che inducono tali formazioni. **(The origin of adventitious roots in cuttings of *Nerium oleander*, and the stimuli which induce such roots to form.)** [English summary 8 lines.]
Ann. Fac. Agrar. Perugia, 1958, **13**: 127-51, bibl. 24, illus.

Oleander cuttings taken in spring from 1- and 2-year-old shoots, and placed in soil or water, developed roots from the cortex and medullary rays, and abundantly from the medulla, immediately after the vegetative buds became active, i.e. within 20–30 days. *In vitro* studies with portions of Jerusalem artichoke tubers showed that root formation was induced by the presence of buds or by IAA at 10^{-7}.

3935. Anzalone, L., Jr.
Studies on flower blight of camellia and cercospora leaf spot of *Photinia serrulata*.
Diss. Abstr., 1959, **19**: 3093, being *L.C. Card No. Mic.* 59-1528 of 98 pp.

[The work on camellia flower blight described here has already been abstracted in *H.A.*, 28: 3976.] Two species of *Cercospora* have been described on *Photinia serrulata*, namely *C. heteromeles* and *C. eriobotryae*. In tests with fungicides, bordeaux sprays consistently suppressed leaf spot on *Photinia*. Tri-basic copper sulphate, although erratic in some greenhouse tests, gave excellent control of leaf spot when sprayed on plants in the field. Captan and ferbam gave good control of the fungus when plants were inoculated shortly after the fungicides were applied and allowed to dry; they gave very little control when the sprayed plants were subjected to weathering. All copper fungicides were somewhat phytotoxic.—La St. Univ.

3936. Chardenon, J., and Taris, B.
Action d'un organomercurique et d'un dérivé nitré du phénol sur le développement de boutures de *Populus*. Quelques remarques sur la reprise de l'activité cambiale chez les *Populus*. **(Action of an organomercuric and a dinitrophenol derivative on the development of poplar cuttings. Some remarks on the renewal of cambial activity in poplars.)**
C.R. Acad. Agric. Fr., 1959, **45**: 138-40.

Cuttings of 5 poplar cultivars were placed in 1, 2 and 5% solutions of the fungicides methoxyethylmercuric chloride and dinitro butylphenol for 10 minutes before being set in pots on 3 dates. In those planted in December and January, 1 and 2% solutions of methoxyethylmercuric chloride had a slightly stimulating effect on rooting. In a batch planted in March the 5% solution was somewhat depressing. The DNBP solution depressed rooting activity even at 1% and particularly in March. [For earlier work see *H.A.*, 27: 1771.]—Inst. nat. agron., Paris, etc.

3937. Taris, M. B., and Chardenon, J.
Quelques remarques sur l'action du chlorure de méthoxyéthyl mercure (3·5% de mercure, 0·6% de chlore) sur l'activité cambiale et le développement des boutures de *Populus*. **(Some observations on the action of methoxyethyl mercury chloride (3·5% of mercury, 0·6% of chlorine) on the cambial activity and development of poplar cuttings.)**
C.R. Acad. Agric. Fr., 1959, **45**: 280-1.

Treated cuttings showed a better strike and produced plants 20 to 30 cm. larger than the controls. The concentrations used were 2, 4 and 8 parts per 10,000, and the cuttings were soaked for 10 min. The development of the cuttings and the nature of the stimulation are discussed.

3938. Rhododendron-Gesellschaft, Bremen.
Rhododendron und immergrüne Laubgehölze. Jahrbuch 1958. **(Rhododendrons and evergreen woody plants. Yearbook 1958.)**
Rhododendron-Gesellschaft, Bremen, 1958, pp. 79, bibls., illus.

The yearbook includes articles on: the growth habit of rhododendron species; the physiological processes involved in frost resistance and in death by frost; rhododendron growing in two German areas; rhododendron and azalea breeding; the importance of peat; rhododendrons in rock gardens; and *R. luteum*.

3939. Rhododendron-Gesellschaft, Bremen.
Rhododendron und immergrüne Laubgehölze. Jahrbuch 1959. **(Rhododendrons and evergreen woody plants. Yearbook 1959.)**
Rhododendron-Gesellschaft, Bremen, 1959, pp. 72, illus.

In addition to travel notes (Scotland) and a short article on rhododendron breeding in Germany the yearbook includes the first part of a series of descriptive notes by G. Krüssmann on evergreen Ericaceae, arranged alphabetically by genera from *Andromeda* to *Loiseleuria*.

3940. Davidson, H., and Watson, D. P.
Teratological effects of photoperiod on *Rhododendron catawbiense* Michx.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 490-4, bibl. 4, illus.

Rhododendron catawbiense showed a malformation of flower buds when grown under photoperiods of 16 hours or longer [see *H.A.*, 28: 2927]. Further experiments showed that the malformation consisted of phylloidy of the bracts and petaloidy of the stamens, and that it was caused by an induction period of too many long days. The results suggest that certain species of rhododendron may require a long-short photoperiod; in other words, a long photoperiod is required for maximum flower bud initiation, followed by a short or decreasing photoperiod for the normal development of the flower buds.—Mich. St. Univ.

3941. EFREMKINA, A. K.
The propagation of *Schizandra chinensis* by softwood cuttings in BSSR. [Russian.]
Uč. Zap. Belorussk. Un-t, 1957, No. 33, pp. 99-106, from *Ref. Ž.* (*Biol.*), 1958, No. 8, Abstr. 34,856.

In White Russia the best time to root cuttings of *S. chinensis* is during the first 3 weeks in June. The cuttings taken from semi-lignified shoots gave a higher percentage of rooting than those taken from lignified shoots. Treatment with an extract of aloe (1 : 100) for 24 hours improved rooting by 10%. For good rooting high humidity (86–90%) at 20–25° C. is essential.

Noted.

3942.

a ANON.
Lyhyttä päivää ja hakelämmitystä. (**Short-day lighting and wood-chip heating.**)
Puutarha, 1959, **62**: 174-6, illus.
Successful for chrysanthemum growing in Finland.

b ARNOTT, H. J.
Anastomoses in the venation of *Ginkgo biloba*.
Amer. J. Bot., 1959, **46**: 405-11, bibl. 23, illus.
Anastomoses are vein unions.

c AYCOCK, R.
Control basal rot [of narcissus] with Dowicide B.
Res. and Fmg N.C., 1959, **17**(3): 9, illus.
See H.A., 29: 2768.

d BOWDEN, W. M.
Phylogenetic relationships of twenty-one species of *Lobelia* L. section *Lobelia*.
Bull. Torrey bot. Cl., 1959, **86**: 94-108, bibl. 17.

e BREEN, H.
Landscape paving for home grounds.
Misc. Ser. Circ. Mich. St. Univ. **E-6**, 1958, pp. 24, illus.
With asphalt, brick, concrete, flagstone, aggregate, tile or wood.

f CAROTHERS, Z. B.
Observations on the procambium and primary phloem of *Pelargonium domesticum*.
Amer. J. Bot., 1959, **46**: 397-404, bibl. 17, illus.

g COGGESHALL, R. G.
Propagating unusual shade trees.
Amer. Nurserym., 1959, **110**(2): 26, 213-16.
By seed, softwood cuttings or grafts.

h FORSBERG, J. L.
Delphinium and larkspur diseases.
Ill. St. Flor. Ass. Bull., 1959, No. 193, pp. 6-9, bibl. 15, illus.
Symptoms and control of bacterial, fungus and virus diseases.

i GIANFAGNA, A. J., AND RATHMELL, J. K., JR.
Growing better house plants.
Circ. Pa agric. Ext. Serv. **491**, 1959, pp. 31, illus.
Notes on environment, care and types of house plants.

j GILLARD, A., AND VAN DEN BRANDE, J.
De heidekruidwortelboorder (*Hepialus hecta* L.) een nieuwe vijand van de kultuur van *Azalea indica* L. (***Hepialus hecta*, a new pest of *Azalea indica*.**)
Landbouwtijdschr., 1959, No. 1, reprinted in *Cult. Hand.*, 1959, **25**: 266-7, bibl. 2.
Recommended control is soil sterilization or soil application of aldrin, DDT or parathion.

k HANSEN, R., AND FRANKE, E.
Die Sichtung des Astilbensortiments. (**A survey of astilbe varieties.**)
Süddtsch. Erwerbsgärtn., 1959, **13**: 79, from abstract in *InformDienst Weihenstephan*, 1959, No. 5, pp. 65-6.
A discussion of requirements and tabulated data on many species, hybrids and varieties.

l HEIMBURGER, M.
Cytotaxonomic studies in the genus *Anemone*.
Canad. J. Bot., 1959, **37**: 587-612, bibl. 31, illus.
A detailed study of chromosome morphology in *Anemone*, *Pulsatilla* and *Hepatica* spp.

m HILLSON, C. J.
Comparative studies of floral morphology of the Labiatae.
Amer. J. Bot., 1959, **46**: 451-9, bibl. 25, illus.
Including a proposed phylogenetic series of the 8 sub-families.

n (HOLLEY, W. D.)
Carnation nutrition.
Flor. Exch., 1959, **132**(22): 12, 36.
Methods adopted at Colorado State University.

o JAIN, R. K.
Some teratological variations in the inflorescences of *Bougainvillea glabra* Choisy.
Curr. Sci., 1959, **28**: 21-2, bibl. 5, illus.
Several abnormalities of flower bracts described and discussed.

p KIVILAAN, A., AND SCHEFFER, R. P.
Detection, prevalence and significance of latent viruses in pelargonium.
Phytopathology, 1959, **49**: 282-6, bibl. 9, illus.
See also *H.A.*, 27: 2696.

q KOBEL, F., AND SCHÜTZ, R.
La création de nouvelles variétés d'hortensias à Wädenswil. **(Breeding new hydrangea varieties at Wädenswil.)**
Rev. hort. suisse, 1959, **32**: 214-15, illus.
A short, popular account.

r KOEK, P. C.
Meeldauwbestrijding bij kasrozen. **(Control of mildew on glasshouse roses.)**
Meded. LandbHogesch. Gent, reprinted in *Cult. Hand.*, 1959, **25**: 184-6.
For a preliminary account of this work see *H.A.*, 28: 3966.

s (KOTHS, J. S.)
Commercial chrysanthemum culture.
Bull. Conn. Flor. Ass., No. 285, reprinted in *Flor. Exch.*, 1959, **132**(11): 17, 21.
Four typical schedules (based on June benching), with nutrition, and pest and disease control.

t MCARTHUR, G. W. F. M.
New rhododendron disease. Leaf-spot fungus recorded in New Zealand.
N.Z. Gdnr, 1959, **15**: 497.
Bordeaux, ferbam or thiram recommended for control of *Cercospora handelii* [see also *H.A.*, 29: 2812].

u (MASTALERZ, J. W.)
Starting poinsettia stock plants.
Pa Flower Grs' Bull., reprinted in *Flor. Exch.*, 1959, **132**(15): 17.
Advice on soils, light, humidity and fertilizers.

v MENNINGER, E. A.
The cultivated eugenias in American gardens. Part I.
Nat. hort. Mag., 1959, **38**: 93-104, illus.
Notes on Old World species, mainly of *Syzygium* and *Eugenia.*

w MILLER, W. J.
The flowering dogwood on Long Island, New York.
Nat. hort. Mag., 1959, **38**: 83-91, illus.
Experience in raising and transplanting seedlings of *Cornus florida.*

x OKUMURA, G. T.
Illustrated key to the lepidopterous larvae attacking lawns in California.
Bull. Calif. Dep. Agric., 1959, **48**: 15-21, bibl. 15, illus.

y PAPE, H.
Spätfrostschäden an Tulpen. **(Late frost damage to tulips.)**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1959, **11**: 93-5, bibl. 4, illus.
A description of injuries to leaves, flowers and peduncles that encourage infection by *Botrytis tulipae.*

z PRING, G. H.
Two new hybrid yellow waterlilies.
Nat. hort. Mag., 1959, **38**: 114-15, illus.
Aviator Pring and St. Louis Gold are suitable for small pools.

3943.

a RILEY, H. P.
Polyploidy in *Gasteria* and *Haworthia.*
Bull. Torrey bot. Cl., 1959, **86**: 81-7, bibl. 12.
All plants examined were diploids, 2n = 14.

b SALIMEI, F. S.
Il *Ficus elastica.* **(*Ficus elastica.*)**
Ital. agric., 1959, **96**: 335-40, illus.
Soil and climatic requirements, vegetative propagation; and other *Ficus* spp. suitable for houseplants.

c SCHICK, H.
Fertilizing shade trees and evergreens.
Ext. Folder Mich. St. Univ. **F-242**, revised 1959, pp. 8, illus.

d (SHANKS, J. B.)
Rooted cuttings from poinsettias.
Md Flor., reprinted in *Flor. Exch.*, 1959, **132**(23): 15.
Recommendations on vegetative propagation.

e SMITH, J. D.
The effect of species and varieties of grasses on turf diseases.
J. Sports Turf. Res. Inst., 1958 (issued 1959), **9**: 462-6.
Effects of 6 diseases on 47 varieties of 14 species tabulated.

f SPERANZA, F.
La coltivazione dei fiori in Sicilia. **(Flower growing in Sicily.)**
Tecn. agric., 1959, **10**: 732-50.
The industry and its problems.

g STATEN, R. D., WATTS, V. M., AND THURMAN, R. L.
Sunturf—a new lawn Bermuda grass.
Ark. Fm Res., 1956, **5**(1): 5, illus., [received 1959].
A variety of *Cynodon magennisii.*

h STOWER, J. S.
The value of irrigation for parks and sports grounds, and some notes on new equipment and techniques.
Parks, 1958, **24**: 22-3, 98-9, 107, 162-3, 171, illus.
Operation, performance and costs of various types of sprinkler.

i USCHDRAWEIT, H. A., AND VALENTIN, H.
Untersuchungen über Kultur- und Wildstauden als Zwischenwirte für wirtschaftlich wichtige Viren. **(Studies on ornamental and wild perennials as intermediate hosts of economically important viruses.)** [English summary 12 lines.]
NachrBl. dtsch. PflSchDienst., Braunschweig, 1959, **11**: 89-92, bibl. 3.

j WELECZKA, —.
Vollmechanisches Roden von Tulpenzwiebeln. **(The fully mechanical lifting of tulip bulbs.)**
Gartenwelt, 1959, **59**: 206-7, illus.
An illustrated description of a German model which lifts ½–¾ ha. of bulbs per day.

k WILLIAMS, R. G.
The Arnold Arboretum spray schedule.
Arnoldia, 1959, **19**(1-2): 1-10.
Controlling pests on shrubs and trees.

l WOOD, G. M.
A new look in lawns.
Vt Fm Home Sci., 1959, **4**(4): 6-7, 15, illus
Notes on Merion Kentucky bluegrass.

m WYMAN, D.
Crab apples of merit.
Arnoldia, 1959, **19**: 15-22, illus.
Grouped under colours of flower, fruit and leaves [see also *H.A.*, 28: 2945r.]

SUB-TROPICAL FRUIT AND PLANTATION CROPS.

Avocadoes.

(*See also* 4015r.)

3944. PENNOCK, W.
The testing and scoring of some avocado varieties and new selections on their behaviour under refrigeration. [Spanish summary ½ p.]
J. Agric. Univ. P.R., 1959, **43**: 34-49, bibl. 5.

A refrigeration tolerance index for each of 32 avocado varieties was worked out on the basis of their performance under 7 treatments, viz. 1, 2, 3 and 4 weeks at 43° F. and 1, 2 and 3 weeks at 53°.

Carobs.

(*See also* 4015e.)

3945. BONIFACIO, G.
Il carrubo. **(The carob.)**
Frutticoltura, 1959, **21**: 287-94.

A plea for the greatly extended planting of the carob in Italy, for its more intelligent cultivation, for the introduction and selection of better varieties. The plant is trioecious, having male, hermaphrodite and female flowers. The best fruits at present come from the female flowers, but insufficient care has been given in the past to ensure adequate pollinators. The hermaphrodite flowers produce more fruits, but they are of lower quality. The author suggests appropriate methods of growing and improving the plant.

Citrus—general.

(*See also* 4015c, d, g.)

3946. RUGGIERI, G.
Progressi tecnici dell'agrumicoltura italiana nell'ultimo decennio. **(Technical advances in Italian citrus culture in the last decade.)**
Riv. Ortoflorofruttic. ital., 1958, **42**: 565-78, bibl. 43. [French edition in *Congrès pomol.* *89*^{me} *Session 1958,* 1959, pp. 123-7.]

The author deals in turn with the more important aspects. *Rootstocks.* In view of tristeza advice is given that new plantings of lemons shall be made on *Citrus volkameriana* rootstocks and of oranges and mandarins on Troyer citrange. The difficulty of propagating Cleopatra hinders its use as a rootstock. *Spacing.* The tendency is to increase spacing to allow about 300 to 400 trees per ha. *Irrigation.* After trying sprinkler irrigation, both above and below tree tops, the tendency now is to revert to basin irrigation as being more economical of water. *Manuring.* The research station at Acireale is instituting yearly leaf analysis with the main interest on the major elements, but not disregarding the minor ones. *Herbicides.* The used of monuron twice a year is proving efficacious. *Hormones.* They are used mainly to check fruit drop. 2,4-D helps also in prolonging the storage life of fruit and in destroying the oxalis weed which defies monuron. *Selection.* Blood orange varieties chiefly used now are Moro, Tarocco and Sanguinello, and others include Washington Navel and some Valencia. A quarantine station is being set up on the isle of Lipari, which it is hoped will facilitate the entry of potentially useful foreign varieties. *Frost protection.* Where necessary, sprinkler irrigation affords most promise and it might be possible in some cases for the apparatus set up for frost protection to function also for ordinary irrigation purposes. *Diseases and pests.* A clone of the lemon variety Femminello, named Santa Teresa, shows early promise of resistance against mal secco. As regards tristeza, such plants of Meyer lemon and Satsuma orange as are showing symptoms of it are being destroyed, but in Sicily the virus does not seem to be spreading amongst these varieties. Hard fruit attributed by S. African workers to boron deficiency is not due to this in Sicily, but appears to be of an infectious nature. Pests discussed include bud and red mites, leafhoppers, fruit flies, scales and ants.

3947. Kuželenko, V. G., and Makarova, T. A.
Initial variety trials on citrus and lemon breeding in MSSR. [Russian, with French and Moldavian summaries.]
Izv. Mold. Fil. ANSSSR., 1957, No. 2-3, pp. 75-84, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,355.

At the Moldavian branch of the Academy of Sciences 78 citrus plants of different varieties were grown in trenches for 5 years. The most adaptable varieties of lemon were Meyer, Villafranca, Genoa, Lunario, Kommune and Novogruzinskij; of orange, Sočinskij; and of mandarin, broad-leaved Unshiu. These varieties showed immunity to bacterial necrosis, produced good quality fruit and made moderate growth. Of the lemons, Novogruzinskij and Kommune had the highest sugar content (2·93 and 2·90%) and the highest vitamin C content (52·8 and 48·6 mg. %), while Lunario and Meyer possessed the highest acidity (6%). As a result of 649 crossings of different lemon varieties 118 hybrid seedlings were produced. By rooting leaves without buds 32 "new forms" were obtained from the callus as material for further breeding.

Citrus—propagation.

3948. Monselise, S. P.
Citrus germination and emergence as influenced by temperature and seed treatments.
Bull. Res. Coun. Israel, Sect. D, 1959, **7D**: 29-34, bibl. 6.

The germination and emergence of sour orange seeds were tested at five different temperatures; the seeds, pre-soaked in water, were germinated in petri dishes. Germinating media were: tap water for untreated seeds and for seeds dipped in powdered charcoal and soak water for untreated seeds [each ml. containing material eluted from 5 seeds]. Other seeds of the same species were germinated in containers at different temperatures and depths [using a vermiculite and gravel mixture]. The optimum for the rate of germination was found at or near 26° C. The presence of inhibiting substances in the soak water was confirmed. Soak water did not delay citrus germination but reduced fungal attack in the petri dishes. Charcoal delayed germination and prevented fungal attack. Both the rate and the ultimate percentage of emergence were negatively correlated with depth. [From author's abstract.]—Earhart Plant Res. Lab., Calif. Inst. Technol.

3949. Hurošvili, K. G.
Cultivation of isolated embryos and tissues as a method of citrus breeding. [Russian and Georgian.]
Bjull. Vses. n.-i. In-ta Čaja i subtrop. Kul'tur, 1957, No. 1, pp. 178-97, bibl. 24, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,353.

The technique of growing citrus embryos on artificial media was studied as a possible means of developing citrus of increased resistance to frost and mal secco disease. The best nutrient solution proved to be Tukey's medium, with the addition of vitamins B_1 and B_2 and plant extracts; from this solution lemon embryos could be transferred into pots after 20–21 days. Nicotinic acid retarded growth. The young embryos grew best at pH 7–7·5 and the older ones at pH 5–6·2. The optimum temperature was 25–27° C., a slightly diffused light was necessary, but with direct illumination by the sun for 20–30 min. daily to increase chlorophyll formation. Adding toxin from the mal secco fungus to the nutrient medium showed that 5–10% concentrations did no harm, but higher concentrations were injurious.

3950. Musillami, S.
Importanza pratica di un sistema per la piantagione degli agrumi in vivaio. (**The importance of cultural practice in the citrus nursery.**)
Tecn. agric., 1958, **10**: 503-11, illus.

Under the present system in Sicily the seedling remains in the seed bed one year. It is then planted out in the nursery, where both the taproot and generally one of the side roots develop to such an extent that the final transplanting and root trimming often results in a shock which has a bad effect on subsequent growth. The alternative as practised in a few small nurseries and recommended by the author is to remove plants from the seed bed at the end of a year, slightly shorten the taproot and insert each plant with its root bent at right angles. This results in plentiful fine root formation and quiescence in growth of the taproot. Later, when the plant is ready for transplanting, it will be very much more easily moved and will restart growth without excessive check.

3951. Bhambota, J. R.
The use of hormones to induce root growth on fruit plant cuttings.
Curr. Sci., 1959, **28**: 126-7.

Naphthalene acetic acid, indole acetic acid and indole proprionic acid at 4,000 p.p.m. were applied in talcum powder to cuttings of sweet lime, sour lime, grapes, and plums. All three hormones caused accelerated and more vigorous rooting, the order of effectiveness being IAA, IPA and NAA for vine and plum, and IAA, NAA and IPA for sweet lime. The results with sour lime were not encouraging.—Govt. agric. Coll., Ludhiana.

Citrus—soil management, irrigation, nutrition and pH

(*See also* 3126, 3552.)

3952. Ōgaki, C., Koto, M., and Takahashi, K.
Studies on sod culture in Satsuma orange orchards. (2.) [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 1-5.

The effects of varying the number of mowings on soil moisture and nutrients and on hay yields, as well as different types of grass and their shade tolerance, were studied in grassed orange groves on volcanic ash soils. With 3–6 mowings yields of hay and the nitrate-N content of the top soil were twice those obtained with a single mowing, and soil moisture was higher in the dry season. Under sod the total pore space and exchangeable K were greater than under clean cultivation. Orchard, perennial rye, and Kentucky blue grass grew well from April to June, but lovegrass was more vigorous during the dry season, giving a 50% greater yield and twice the dry matter. The yield of ladino clover was lower than that of any of the grasses. Shade had little effect on orchard or Kentucky blue grass, but reduced the yield of lovegrass by 80%, strongly inhibited perennial rye grass and killed timothy grass and ladino clover. [For part 1, see *H.A.*, 29: 1807.]

3953. Yukawa, I., Koto, M., and Takahashi, K.
Experiment on the permeation of the major elements and mineralization of fertilizer under different soil managements in Satsuma orange.
[Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 12-14, bibl. 7.

A mixture of mineral and organic N, P and K fertilizers was either broadcast, broadcast and ploughed in, or placed in the furrow; the plots were also either mulched or clean weeded. Mineralization of the N took 30–40 days and was more rapid when broadcast. No permeation of the P could be detected after 3 months. The K permeated more quickly than the N, with a correlation between the depth of permeation and the time elapsing since application. Apart from the P, depth of permeation and degree of mineralization were greatest when the fertilizer was ploughed in and the plot mulched.

3954. Taylor, O. C., Stolzy, L. H., and Harding, R. B.
Effect of management practices on production, soil physical properties.
Calif. Citrogr., 1959, **44**: 285-8, bibl. 1.

In the Citrus Grove Rejuvenation Project at the University of California Citrus Experiment Station improvement of the environment in the irrigated inter-rows was attempted by mulches, sprinkler irrigation and soil fumigation by DD. In the first season the change from furrows to sprinklers stimulated the vegetative growth and fruit size of declining trees; in general, however, the irrigation method did not affect production or fruit size. The force of water droplets from high sprinklers tended to compact the soil surface and to reduce the rate of water infiltration in one plot, but this condition was improved by a mulch of wood shavings. Soil fumigation with DD reduced yield and fruit size, especially in groves in a state of decline.

3955. Pearson, H. E., and Huberty, M. R.
Response of citrus to irrigation with waters of different chemical characteristics.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 248-56, bibl. 7.

In a 15-year study mature Washington Navel and Valencia orange trees were irrigated with (1) a well water of low salinity, (2) natural Colorado river water with a high Ca content, or (3) treated Colorado river water with a high Na content. Valencia yields showed no significant differences attributable to quality of irrigation water. Navel orange yields showed a reduction after 5 years when irrigated with high Na water, as compared with well water. The addition of gypsum to the high Na water was beneficial. From the 7th to the 15th year, the average Navel orange yields on the plots receiving natural river water, treated water with gypsum and treated water without gypsum were 5, 10 and 15% lower, respectively, than on plots receiving well water. The percentages of Na in leaf and root tissues increased with the Na in the water, but were reduced by the application of gypsum. The effects of these irrigation waters on physical and chemical characteristics of the soil are also reported. The reduction in reserve Ca which occurred in plots receiving the high Na water was offset in the upper 2 ft. of soil by the addition of gypsum. This also improved infiltration rates and tree vigour.—Metrop. Water District south. Calif., La Verne, and Univ. Calif., Los Angeles.

3956. Koo, R. C. J., Reitz, H. J., and Sites, J. W.
A survey of the mineral nutrition status of Valencia orange in Florida.
Bull. Fla agric. Exp. Stats **604**, 1958, pp. 59, bibl. 31.

This survey covered 168 commercial groves from 1953-56 and involved evaluating the relationships between fruit production and quality of the trees and their mineral status as ascertained by leaf, fruit and soil analyses. Nitrogen was the only nutrient the status of which could be correlated with yield, although there were correlations between the amounts of P applied as fertilizer and those in the fruit, and between K applications and the K content of both leaves and fruit. Ca and Mg contents were related to soil reaction, the highest Mg contents being found where the soil pH was 5·9. The available P in the soil and the K contents of leaf and fruit were influenced by the Cu content of the soil. The mineral content of the leaves was found to have less effect on fruit quality than that of the fruits themselves. [See also *H.A.*, 29: 797.]

3957. KOTO, M., AND TAKESHITA, S.
Experiment on leaf analysis of Satsuma orange. No.4. Leaf and soil analyses of manganese and magnesium deficient Satsuma orange orchards in Kanagawa Prefecture, part 2. [Japanese, with English summary ¼ p.]
Bull. Kanagawa agric. Exp. Stat., hort. Branch, 1959, No. 7, pp. 6-11, bibl. 19.

Highly significant positive correlations were obtained between the Mn contents of the leaves and of the top 50 cm. of the soil, and negative correlations between the former and the soil pH. A similar correlation was found between leaf Mg and soil Mg, but none between leaf Mg and the soil pH. [For No. 3, Part 1, see *H.A.*, 28: 1802.]

3958. LABANAUSKAS, C. K., AND OTHERS.
Effects of soil applications of nitrogen, phosphate, potash, dolomite, and manure on the micronutrient concentration in Valencia orange leaves.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 257-66, bibl. 27.

Heavy N fertilization with ammonium sulphate and ammonium nitrate significantly increased the Mn concentration in Valencia orange leaves, but N from calcium nitrate had no significant effect on Mn concentration. N from all 3 sources significantly reduced the B concentration in the leaves [see also *H.A.*, 29: 1820]. Heavy P applications significantly reduced leaf concentrations of Cu and increased those of Mn and Fe. K applications reduced leaf Mn and increased leaf B. Intermediate amounts of dolomite reduced leaf concentrations of Cu but had no effect on Zn, Mn, B or Fe [see also *H.A.*, 29: 2841]. Leaves of trees mulched with steer manure contained less Cu and Mn and more B than those of trees that received the same amount of N from ammonium nitrate. The following interactions were observed: where P was not applied, K applications reduced leaf Zn, and vice versa. K applications reduced leaf Mn at the high and low levels, but not at the intermediate level, of dolomite application. When no K was given, intermediate applications of dolomite reduced leaf Fe, and when K was given, high applications of dolomite slightly reduced leaf Fe. There are indications that many unknown factors affect the micronutrient concentration in Valencia orange leaves during the growing season and from one season to another.—Univ. Calif., Riverside.

3959. JONES, W. W., AND EMBLETON, T. W.
The visual effect of nitrogen nutrition on fruit quality of Valencia oranges.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 234-6, bibl. 7, illus.

Urea foliage sprays properly timed resulted in better quality fruit than did properly timed soil applications. Summer foliage or soil applications of N resulted in poor quality fruit. N applications above the amounts required to maintain production resulted in a reduction in fruit quality. These results occurred only after the N nutrition of the trees had come into equilibrium with the treatments. [From authors' summary and conclusions.]—Univ. Calif., Riverside.

3960. KESSLER, B., AND MONSELISE, S. P.
Studies on ribonuclease, ribonucleic acid and protein synthesis in healthy and zinc-deficient citrus leaves.
Physiol. Plant., 1959, **12**: 1-7, bibl. 11.

Leaves of Shamouti orange budded on sweet lime were used in these studies, in which the activity of RNAase was found to be higher in the Zn-deficient leaves. Levels of protein and RNA, however, were relatively lower in Zn-deficient than in healthy leaves. The effect of Zn on protein and RNA synthesis is discussed.—Hebrew Univ., Rehovot, Israel.

3961. RASMUSSEN, G. K., AND SMITH, P. F.
Effects of H-ion concentration on growth of Pineapple orange seedlings in alternate solution and water cultures.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 242-7, bibl. 14, illus.

Pineapple orange seedlings were grown for 9 months in nutrient solution cultures adjusted to pH 4 or pH 6 for 0, 2·3, 4·7, or 7 days each week with the reciprocal time in rainwater adjusted to pH 4 or 6 in various combinations, in an attempt to separate direct effects of H-ions on growth from indirect effects. With constant pH the length of time in nutrient solutions limited growth, indicating that nutrient absorption was one limiting factor. Growth was severely inhibited at pH 4 as compared with pH 6. Rainwater adjusted to pH 4 was as detrimental to growth as nutrient solutions at the same pH, or even more so. Seedlings grown in pH 6 nutrient solutions alternated with pH 4 rainwater for various parts of each week grew no better than the seedlings which grew continuously in pH 4 conditions with the same percentage of time in nutrient solutions. The toxic effect of pH 4 nutrient solutions could be alleviated to a considerable extent by growing the seedlings in pH 6 rainwater for a portion of each week. Roots which grew under continuous highly acid conditions were brown, stubby, and swollen in comparison with the white, smooth ones which grew in pH 6 water part of each week or continuously in pH 6 solution. Since dilute H_2SO_4 at pH 4 was as injurious to growth as acidic nutrient solutions, it seems logical to assume that H-ions are directly toxic to roots rather than through some indirect harmful effect of mild acidity. Absorption of the macronutrients was inhibited by highly acid nutrient solutions as compared with pH 6 nutrient solutions. Absorption of the macronutrients increased as the percentage of time in nutrient solutions increased. Absorption of the macronutrients by seedlings grown one-third of the time in pH 4 nutrient solutions and two-thirds in pH 6 water was about equal to that by seedlings grown continuously in pH 4 nutrient solutions. [Authors' summary.]—U.S. Dep. Agric., Orlando, Fla.

Citrus—pruning and various growth phenomena.

3962. Norris, R. E.
Planting and thinning practices for maximum production—a look into the future.
Citrus Ind., 1959, **40**(7): 5-7, 10-11, illus. and repeated in *Citrus Ind.*, 1959, **40** (9): 5-7, 10.

Four methods are discussed for reducing grove populations, namely, hedging, thinning by tree removal, topping or "buckhorning", and initial close spacing with subsequent thinning. Each of these practices was found to improve production and quality of fruit in several groves studied. Hamlin groves recovered their production levels more quickly than Valencias after thinning operations. 27-year-old Valencias on rough lemon were successfully transplanted with bare roots by lifting them with a bulldozer and setting them in a new location with a similar soil type. On sour orange stocks Valencias of the same age did not transplant so easily.

3963. Wiley, J. W.
Pruning keeps profits up.
West. Fruit Gr, 1959, **13**(6): 45-6, illus.

Various successful pruning methods for dealing with close planted and overcrowded orange orchards were tested, culminating in "hedge" cutting the rows in both directions to leave 9-ft. gaps between trees planted at 22 × 22 ft. Under the conditions described the trees recovered rapidly and gave increased yields.

3964. Baldini, E.
Indagini e osservazioni sugli sferoblasti degli agrumi. **(An investigation and notes on sphaeroblasts in citrus.)**
Stud. sassar. Sez. III, 1957, 1959, **5**: 68-78, bibl. 20, illus.

The author has switched his studies on sphaeroblasts [see *H.A.*, 26: 3355 and 27: 3878] to those of adult trees of orange, mandarin and lemon. His observations indicate that their origin lies in the renewed activity of some of the parenchymatous cells of the medullary rays around groups of sclerenchyma cells, which differentiate in certain areas of the bark, mainly in the trunk and larger branches. He notes that, following drastic pruning carried out to remedy frost damage, sprouts formed from the sphaeroblasts. He briefly discusses their biological significance in relation to ontogenesis and juvenility in woody plants.—Univs Florence and Sassari.

3965. Liu, H. C., and Wu, U. W.
A study of fruit bud differentiation in sweet orange. [Chinese, with English abstract ½ p.]
Acta bot. sin., 1957, **6**: 134-40, bibl. 8, illus., [received 1959].

Anatomical investigations of fruit buds from 26- to 27-year-old sweet orange trees in 1954-55 and 1955-56 led to the recognition of 7 stages of development. Initiation began in the 3rd week of November, the calyx differentiated on December 20, the corolla on February 9, and shortly after this the stamen primordia appeared. Lastly, pistil primordia were formed during the first fortnight of March. Warmer and drier weather in the autumn and winter advanced bud differentiation and flowering.

Citrus—pollination and fruit ripening.

3966. El-Tomi, A. L.
Effect of cross pollination on June-drop, pre-harvest drop, and cropping in Washington Navel orange. [Arabic summary ½ p.]
Ann. agric. Sci. Cairo, 1957, **2**(2): 249-66, bibl. 12, [received 1959].

The effects of 6 pollinating varieties on Washington Navel oranges were studied for 2 seasons. June drop accounted for most of the pre-harvest losses; a minor loss occurred in October. All pollinators, except Baladi orange, decreased June drop and all increased cropping (Baladi orange in 1 season only), the decreasing order of effectiveness being Gizawi shaddock, sour orange, Duncan grapefruit, sweet lemon and Sukkari orange.—Ain Shams Univ.

3967. El-Tomi, A. L.
Some studies on seediness of Washington Navel orange. [Arabic summary 1 p.]
Ann. agric. Sci. Cairo, 1957, **2**(2): 267-74, bibl. 5, illus., [received 1959].

Six pollinating varieties were tested. Whereas fruit which developed through parthenocarpy was seedless or had only 1 empty seed per fruit, cross-pollination produced seedy fruit, the average number of seeds ranging from 2·00 using sweet lemon to 6·67 using sour orange. Baladi orange, Gizawi shaddock, sour orange and Duncan grapefruit also affected both the size and shape of Navel seeds. Sweet lemon, sour orange and Duncan grapefruit were the most promising pollinators.—Ain. Shams Univ.

3968. Basson, W. J.
Arsenical sprays reduce acids in citrus juice.
Fmg S. Afr., 1959, **35**(4): 52-3.

In the eastern Transvaal lowveld excellent results were obtained by spraying Valencia trees for 4 successive years with a solution of 2 lb. lead arsenate in 100 gal. water. An application in October ave better results than later sprays. Tests on rsenic accumulation indicated that calcium arsenate was the best form for annual sprays, and, at ½ lb. per 100 gal. water, it accelerated ripening y 20 to 60 days. Combination sprays of parahion and/or malathion with arsenate were as ffective as arsenate alone, without affecting nsecticidal properties.

Citrus—climatic injuries.

(*See also* 3987.)

3969. Pettinari, C. M.
Anomalie fogliari causate da freddo su foglie di agrumi. (**Damage to citrus leaves due to cold.**)
Boll. Staz. Pat. veg. Roma, 1959, **16**: 77-86, bibl. 10, illus.

Observations, macro- and microscopic, were made on lemon leaves checked by late spring cold in central Italy. The main symptoms were necrosis of the leaf tip and curling.

3970. Nadaraja, G. B., and Pogorelov, N. V.
Prostrate cultivation of lemons and oranges. [Russian and Georgian.]
Bjull. Vses. n.-i. In-ta Čaja i subtrop. Kul'tur, 1957, No. 1, pp. 108-15, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,356.

On the Black Sea shore of the Caucasus, growing lemons and oranges with a prostrate habit and covering groups of them with 3 layers of cheesecloth is recommended. This method protects the plantations from temperatures down to —9° C. and, under snow, down to —15° C. Recommendations are given on establishing new groves with prostrate trees and on converting old ones to prostrate forms.

3971. Georg, J. C.
The use of wind machines for frost protection of Florida citrus, 1958-59.
Citrus Ind., 1959, **40**(7): 14-17.

Results in general substantiated the conclusions of an earlier season's work [see *H.A.*, 29: 1803], except that in mature groves the machines did not destroy the inversion 270 ft. from the machine as effectively as anticipated. There are increasing indications that air density affects the degree of air mixing obtainable by the machine.

3972. Kočerženko, I. E., and Bryzgalov, K. A.
Premature leaf fall in lemons during the winter under living-room conditions and in lemon houses. [Russian and Georgian.]
Bjull. Vses. n.-i. In-ta Čaja i subtrop. Kul'tur, 1957, No. 1, pp. 142-57, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,357.

In centrally heated living rooms leaf drop was caused by insufficient light and sharp changes in the environment. Improved light conditions and increased humidity reduced losses. In glasshouses the penetration of smoke, especially at high humidity, caused mass leaf abscission.

Citrus—diseases and pests.

(*See also* 3929, 3991-3993, 3995, 4015f, o, q, 4148, 4156.)

3973. Knorr, L. C.
Fovea—a disease of concern to Murcott growers.
Citrus Ind., 1959, **40**(6): 5-7, 16, bibl. 1,
Knorr, L. C., and Price, W. C,
Fovea—a disease of the Murcott.
Citrus Mag., 1959, **22**(1): 16-19, 26, bibl. 6, illus.

The symptoms and effects of a virus-like trouble affecting Murcott trees (Smith tangerine, Murcott Honey orange) are described. Fovea may be a virus (possibly xyloporosis), and control recommendations include the use of healthy budwood.

3974. McClean, A. P. D., and Engelbrecht, A. H. P.
Xyloporosis, cachexia and abnormal bud-unions in South African citrus trees. [Afrikaans and French summaries ¾ p. each.]
S. Afr. J. agric. Sci., 1958, **1**: 389-413, bibl. 25, illus.

In rootstock experiments in South Africa the trees formed from scion varieties on sweet lime stocks have usually performed badly. The extreme stunting of some of the scions, and the type of pitting in the sweet lime stocks under them, is strong evidence for the occurrence of xyloporosis virus in such scions. The presence of the virus in two scions—a Lisbon lemon and a Eureka lemon—was confirmed by an inoculation test to seedlings of the Orlando tangelo. Examples of abnormal unions in citrus trees of various scion/stock combinations are described from South Africa. They are similar to those reported from other countries. [Authors' abstract.]—Div. Plant Path., Pretoria.

3975. Rangaswami, G., Rao, R. R., and Lakshmanan, A. R.
Studies on the control of citrus canker with streptomycin.
Phytopathology, 1959, **49**: 224-6, bibl. 11.

Streptomycin sulphate, when sprayed in aqueous solutions together with 1% glycerine on acid lime (*Citrus aurantifolia*), was found to be absorbed by the leaves better than when sprayed alone. Indications were obtained of the presence of the antibiotic in the leaf sap of 3-year-old citrus plants within 12 hours of spraying, and also of its persistence up to 21 days after spraying. Streptomycin sulphate at 1,000 and 500 p.p.m. sprayed at 15-day intervals effectively checked citrus canker, caused by *Xanthomonas citri*, but did not do so at 250 and 100 p.p.m. There were indications to show that the canker bacterium was killed *in vivo* by antibiotic spray at high concentrations. [Authors' summary.]—Annamalai Univ., Annamalainagar, Madras.

3976. Rangaswami, G., Rao, R. R., and Lakshmanan, A. R.
Control of citrus canker with antibiotics.
Curr. Sci., 1959, **28**: 167, bibl. 4.

Following a successful trial on the use of streptomycin sulphate to control *Xanthomonas citri* [see preceding abstract] several commercial formulations, a pharmaceutical grade of streptomycin sulphate and bordeaux mixture were tested against the disease on 5-year-old acid lime trees. Effective control was again obtained by spraying at 15-day intervals with the streptomycin sulphate at 500 p.p.m., and also with Phytomycin (20% streptomycin nitrate) at 2,500 p.p.m.

3977. Puzzi, D., and Orlando, A.
Principais pragas dos pomares cítricos. **(The principal pests of citrus groves.)**
Biológico, 1959, **25**: 1-20, bibl. 13, illus.

Details are given on the use of poisoned bait sprays against the fruit flies *Ceratitis capitata* and *Anastrepha mombinpraeoptans* [see *H.A.*, 29: 1841]. Control measures adopted in Brazil and elsewhere against the rust mite (*Phyllocoptruta oleivora*), various scale insects, aphids, borers, the beetles *Macrodactylus pumilio* and *M. suturalis*, and the Irapuá bee (*Melipona ruficrus*) are also reviewed.

3978. (Georgala, M. B.)
Staley's Sauce No. 7, fruit fly bait.
Citrus Gr, 1959, No. 304, pp. 9, 12.

Staley's Sauce No. 7, which was recommended for fruit fly control [see *H.A.*, 29: 1842], is under certain conditions incompatible with the copper residues of scab sprays.

3979. Knorr, L. C.
Presenting brevipalpus mites and some questions that they pose.
Citrus Mag., 1959, **21**(10): 8-12, 22, bibl. 20, illus.

Brevipalpus mites are normally controlled by sulphur materials in the spray schedule, and there are indications that *B. phoenicis* may become serious when only zineb sprays are used.—Fla Citrus Exp. Stat., Lake Alfred.

3980. Munger, F., Gilmore, J. E., and Davis, W. S.
A disease of citrus red mites.
Calif. Citrogr., 1959, **44**: 190, 216, illus.
Smith, K. M., and others.
A suspected virus disease of the citrus red mite *Panonychus citri* (McG.).
Nature, 1959, **184**: 70, bibl. 3, illus.

A transmissible disease causing paralysis and diarrhoea in citrus red mites has been isolated. Its possible value in the control of these and other red spider mites had yet to be determined.—A.R.C. Virus Res. Unit, Cambridge, and Agric. Res. Serv., Whittier, Calif.

3981. Calcagnolo, G.
Os laranjais paulistas estão sendo prejudicados pelo ataque de mais uma espécie de ácaro. **(Orange groves in S. Paulo are being damaged by another species of mite.)**
Biológico, 1959, **25**: 33-8, bibl. 1.

The new pest is *Hemitarsonemus latus* and the most susceptible orange varieties are Baianinha and Piralima. Attacks are moderately heavy on Hamlin and Natal, and light on Valencia types. Preliminary attempts at control have not given very promising results, but have shown that sulphur dusting is more effective than zineb. Control of the same pest on other crops is mentioned, the most promising acaricide being endrin.

3982. Flanders, S. E., Gressitt, J. L., and Fisher, T. W.
***Casca chinensis,* an internal parasite of California red scale.**
Hilgardia, 1958, **28**: 65-91, bibl. 25, illus.

The history of the attempts to establish this specific parasite of *Aonidiella aurantii*, indigenous to south China, in California is related. The life history and general morphology of the insect are described and problems of breeding, especially that of rearing males, are discussed. It is still considered possible that successful control of the California red scale may be obtained by this means.

3983. DeBach, P., and Landi, J.
Integrating chemical, biological control by strip treatment.
Calif. Citrogr., 1959, **44**: 324, 345-7, 352, bibl. 3.
Strip treatment with chemicals.
Calif. Agric., 1959, **13**(8): 14-15.

Control of purple scale (*Lepidosaphes beckii*) by treating alternate pairs of rows every autumn with an oil spray is recommended. This results in financial savings to the grower, and allows biological control by natural predators to continue unchecked.—Univ. Calif., Riverside.

3984. Riehl, L. A., and Wedding, R. T.
Effects of naphthenic and paraffinic petroleum fractions of comparable molecular weight on transpiration of Eureka lemon and Bearss lime plants.
J. econ. Ent., 1959, **52**: 334-5, bibl. 10.

Plants of Eureka lemon and Bearss lime were grown in pots in a glasshouse with a maximum temperature of 92° F. during the day and a minimum of 66° F. during the night. On the day following the application of concentrations of 1·75% oil in aqueous mixture transpiration of the oil-sprayed plants was reduced to less than half that of untreated plants by both naphthenic and paraffinic oils and for both varieties of citrus. Oil-sprayed plants recovered with time. For narrow-cut fractions of comparable molecular weights of 306 and 308 recovery was faster in the plants sprayed with naphthenic oil than in those sprayed with the paraffinic oil. [From authors' abstract. See also *H.A.*, 29: 827.]—Univ. Calif., Riverside.

Citrus—fruit handling, storage and composition.

(*See also* 4015b, i.)

3985. EAKS, I. L., AND WALDAPFEL, C. J.
Bulk handling of California-Arizona citrus fruit. Part 1. Effects on fruit quality.
PERRY, R. L., AND JOHNSON, M.
Idem. Part 2. Systems and engineering elements.
SMITH, R. J., AND ROCK, R. C.
Idem. Part 3. Economics.
Calif. Citrogr., 1959, **44**: 183, 201-4, bibl. 15; 218-19, 228-34, illus.; 256, 264-9, 292, 309-11, bibl. 4.

There are 6 systems of bulk handling in use in southwestern citrus orchards, viz. boom hoist, field fork lift, straddle carrier, mounted bin trailer, bulk trailer, and elevator and bulk truck. Choice of system depends on conditions in the packhouse. Fruit injury is no more and probably no less than for fruit handled in field boxes. Among costs involved in bulk handling the following are very important: labour involved in handling, power requirement costs, picking costs as affected by hauling methods, and house operations, all of which may prove to be more important than the specific cost of the container.

3986. ROGERS, H.
Drums for citrus—why not?
West. Fruit Gr, 1959, **13**(6): 42-3, illus.

Bulk harvesting bins were made of moulded fibre, 24 in. and 20½ in. in diameter at top and bottom respectively. They hold 220 lb. of fruit but weigh only 13 lb. when empty. They are lifted on to the trailer by 3-point clamps which fit below a ½-in. lip on the drum.

3987. GRIERSON, W., AND HAYWARD, F. W.
Evaluation of mechanical separators for cold damaged oranges.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 278-88, bibl. 8, illus.

Frosted fruit separators operating on differences in specific gravity between sound and damaged fruit were found to be capable of delivering a satisfactory No. 2 grade at the cost of 24 to 64% packable fruit included among the rejects. A No. 1 grade should not be expected from a damaged crop. Very heavily damaged crops hardly repay the expense of separation as the pack-out is very low. When two separators are to be used, differences in specific gravity between large and small fruit make advisable prior separation into larger and smaller sizes, which are then run through separate machines set in parallel. Errors due to inadequate sampling and adjustment facilities greatly compounded any inherent faults in these machines. With emulsion-type separators special measures are advised for efficient transfer of emulsion and for reclamation of emulsion carried out by the fruit. [Authors' summary.]—Fla Citrus Exp. Stat., Lake Alfred.

3988. LONG, J. K., AND LEGGO, D.
Cleaning citrus fruits by washing.
Agric. Gaz. N.S.W., 1958, **69**: 581-4, bibl. 1, illus.

A 2-minute immersion in cold alkaline bleach is recommended for Australian sooty blotch and sooty mould; for the former 7·5% sodium hypochlorite (12½% available chlorine) or 12½% chloride of lime with 1% of sodium bicarbonate or 0·75% boric acid; for the latter 12½% sodium hypochlorite or 25% chloride of lime with 2% sodium bicarbonate or 1½% boric acid. Other moulds and dirt can be removed by warm (90–110° F.) 0·2% sodium metasilicate and mechanical scrubbing. These recommendations are the outcome of investigations at the Citrus Wastage Research Laboratory, Gosford.

3989. MUSILLAMI, S.
Indagini preliminari sulle cause determinanti la perdita del calicetto nei Verdelli sottoposti ad ingiallimento forzato. **(Preliminary investigations on calyx loss in Verdelli lemons submitted to artificial colouration.)**
Tecn. agric., 1958, **10**: 751-61, bibl. 11, illus.

The "Verdelli" lemons of southern Italy are obtained from forced flowering induced by the withholding of irrigation for about a month in the summer, which results in fruit for harvesting the following summer. On picking they are normally submitted to acetylene treatment for 60–80 hours in order to get the desired yellow colour before marketing. This system, which is described, has the disadvantage that in some cases the lemons lose their buttons, which gives them the appearance of having fallen from the trees, a feature unpopular on the market. From an examination of the incidence of button loss in the packed lemons in the different layers, it is concluded that this phenomenon can be considerably reduced if a temperature of 26° C. and a humidity of about 70% are maintained during the acetylene process.

3990. U.S. DEPARTMENT OF AGRICULTURE.
Storage behavior of desert-grown lemons.
Agric. Mktg, 1959, **4**(3): 11.

Desert-grown lemons lost weight at a rate of 2–3% per month when held at 58°–60° F. and 89–91% R.H. The rind accounts for about 45% of the total weight of fresh lemons, but this proportion decreased to about 40% after 1 month's storage. More juice per pound was obtained after 2 months' storage than immediately after picking. After 3 months' storage the fruits became bright yellow with some bronzing, which increased with further storage. Fruits softened when storage was extended beyond 3 months. Acid concentrations in Eureka and Lisbon fruits decreased slowly after the first month of storage; and tree-ripened lemons gave less acid per ton than lemons picked while still green. The ascorbic acid content remained almost constant during storage. Darkening of the buttons was erratic and could not be closely related to fruit decay. Decay was low in all test lots picked at the dark-green stage, except for Villafrancas from trees on rough lemon rootstocks. In general, the percentage of decay was related to colour at picking, but it was always far below that of tree-ripened fruit.

3991. Moreau, C.
Le test Benlloch et ses applications. **(The Benlloch test and its uses.)**
Fruits d'Outre Mer, 1959, **14**: 211-17, bibl. 5, illus.

A test is described for evaluating the efficiency of fungicidal baths against *Penicillium* blue and green moulds of harvested citrus. The test consists of systematic scarification followed by immersion in the fungicide and finally inoculation with a culture of spores. The effectiveness of the fungicide is judged by a standard scale of fungal development.

3992. Gunther, F. A., and others.
Generation of ammonia for in-package fumigation of foodstuffs.
J. agric. Food Chem., 1959, **7**: 489-96, bibl. 27, illus.

Ammonia gas is fungicidal to some common mould organisms [including blue and green moulds of citrus fruits], but bulk fumigation with this gas may not afford the long-term protection sometimes required under commercial conditions. In-package generators of ammonia have been developed to maintain critical gas concentrations surrounding a fresh commodity over controlled periods, activated by the highly humid environment within a package of actively respiring plant parts. Two types of practical generator are discussed, with applications to citrus fruit handling. The first involves simple hydrolysis of diammonium succinate; the other utilizes the moisture-initiated reaction between dry ammonium sulphate and dry soda ash. [From authors' abstract.]—Univ. Calif., Riverside.

3993. Gunther, F. A., and others.
Sorption of ammonia by fruits, vegetables, eggs, and fiberboard in dynamic systems.
J. agric. Food Chem., 1959, **7**: 496-502, bibl. 22.

With a view to developing a practical fumigation treatment for packed citrus fruit, and possibly for other commodities also, the comparative rates of sorption and desorption of ammonia gas surrounding packed products were evaluated in a dynamic system with a spectrophotometric technique, supplemented by direct chemical assay. The report is largely concerned with the citrus fruit–ammonia equilibrium and with the role of the carton components in this equilibrium. Twenty other fruits and vegetables, and eggs, were also studied, for comparison with citrus fruits and to determine possible damage due to shipment with treated citrus. Ambient ammonia concentrations ranged from about 50 to 700 p.p.m. in air. Sorption rates varied from about 1 to about 150 p.p.m. per hour. Fibreboard was shown to have a buffer capacity for ammonia. It is concluded that mixed refrigerated shipments of ammonia-treated citrus fruits with other perishable commodities might cause damage to some of them, particularly strawberries.—Univ. Calif., Riverside; Monsanto Chem. Co., St. Louis, Mo.; and Sunkist Growers, Inc., Ontario, Calif.

3994. Eaks, I. L.
Effect of ammonia gas fumigation on respiratory rate, chemical composition of juice, and general appearance and vitality of lemon and orange fruits.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 237-41, bibl. 8.

Under the conditions of this experiment ammonia fumigation had no effect on the respiratory rate, the chemical composition of the juice or the general appearance of the fruit, when compared with untreated fruits. The button [calyx] condition was adversely affected, however; the buttons tended to lose vitality, as indicated by discoloration or loss of the button. A high fumigation dosage caused more button damage than lower dosages. [From author's summary.]—Univ. Calif., Riverside.

3995. Withers, R. B.
Sterilisation.
Citrus News, 1959, **35**: 20-1.

Investigations in Australia into fruit fly sterilization in citrus have shown that low temperature treatment for 14 days at 31° F. is effective and practicable, but difficult in view of cool store accommodation and costs. Fumigation experiments with ethylene dibromide have shown that at 70° F. a residue of not less than 2 p.p.m. EDB in the juice extracted 30 min. after fumigation ensures complete destruction of the larvae. A dosage of 10 oz. EDB per 1,000 cu. ft. for 2 hours at 70° F. was fully effective. At lower temperatures higher dosages were necessary, e.g. 50% higher at 50–55° F. than at 70° F. At temperatures of about 55° F. Navels were not injured by dosages of up to 3 lb. EDB per 1,000 cu. ft., but Valencias were more sensitive. Larvae proved more resistant to EDB at low temperatures, and less of the fumigant was taken up by the fruit. Wrapped and packed fruit absorbed EDB satisfactorily, but waxed fruit absorbed less than unwaxed. Eggs and pupae were more resistant than larvae and adults. Work on fumigation in plastic tents is also described, and this appears to offer the best method for wide-scale fumigation at reasonable cost. The future programme of investigations is outlined.

3996. Grierson, W., and Hayward, F. W.
Fumigation of Florida citrus fruit with ethylene dibromide.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 267-77, bibl. 21, illus.

Various paints, varnishes, films, etc., were tested for suitability for use in EDB fumigation rooms and several were found satisfactory for such use. A truck fumigation chamber for fresh fruit fumigation in bulk is described. The effect of various fumigation variables on peel injury and subsequent keeping quality were investigated. EDB dosage, temperature, and duration of fumigation could be varied within reasonable limits without apparent harm, but with fumigation in a lightly-loaded fumigation chamber the fruit incurred grave risk of peel injury, particularly with grapefruit and kumquats. Of the 9 types of citrus studied, only oranges (Pineapple and Valencia varieties were used) proved susceptible to increased decay due to the high EDB dosages necessary at low fumigation temperatures. EDB and HCN fumigation was carried out simultaneously without injury to the fruit. [Authors' summary.]—Citrus Exp. Stat., Lake Alfred, Fla.

3997. Sinclair, W. B., and Jolliffe, V. A.
Free galacturonic acid in citrus fruits.
Bot. Gaz., 1958, **120**: 117-21, bibl. 21.

Little or no mono-galacturonic acid was present in Valencia oranges during either natural or artificial ripening, or in the juice allowed to stand after extraction. The bearing of these findings on the biosynthesis and enzymic decomposition of pectic substances in citrus fruits is discussed.

Dates.

(*See also* 4015m, 4145.)

3998. Marassi, A.
La palma da dattero nel Mediterraneo europeo, con riferimento particolare alla Spagna. **(The date palm in Mediterranean Europe, with special reference to Spain.)**
Riv. Agric. subtrop., 1959, **53**: 153-75, bibl. 15, illus.

Date palms in Spain are propagated mainly from seed, and frequently grown in association with *Phoenix canariensis*, from which the male inflorescences are removed in bud to prevent hybridization. In some areas the palms are intercropped with cereals, lucerne, cotton or fruit trees. Irrigation water is generally saline, the salt content ranging from 2·5 to 7 g./l.; thus good drainage is essential. The soil is cultivated at the beginning of the dry season and again after harvest, with an occasional application of manure. To hasten the ripening of the fruit some of the leaves are cut away or shortened, and the fruit bunches are tied up to avoid wind damage. Insufficiently ripened fruit is dipped in oil and stored for 2–3 days in boxes covered with coarse cloth. Low-grade fruit is used as cattle fodder. Yields per palm sometimes reach 200 kg. in the neighbourhood of Elche, near Alicante, but range only from 22 ot 30 kg. in other regions. The production of blanched palm leaves is commercially important, particularly in the Alicante and Murcia provinces. Groups of leaves on unproductive or male palms are tightly bunched and covered, each palm being so treated every 4th year.

Litchis.

3999. Mustard, M. J.
The megagametophytes of the lychee (*Litchi chinensis* Sonn.).
Diss. Abstr., 1959, **19**: 3079, being *L.C. Card No. Mic.* 59-1590 of 91 pp.

Litchi flowers were classified into 3 types according to the chronological order of their development, Type I functioning only as males, Type II as females, and Type III as males. All flower types contained anatropous ovules differing from one another in degree of development. Degeneration was observed in Type II flowers from the time of initiation of megasporogenesis and throughout the period of fertilization. It ranged from 50% to 75%, although this was not sufficient to account for the excessive shedding of young fruits. Partial defloration of the panicle markedly reduced the percentage of degeneration in Type II flowers. It is suggested that competition for nutrients and water may be a factor contributing to the retardation and degeneration observed in the megagametophytes of litchis.—Ohio St. Univ.

4000. Joiner, J. N.
The effects of differential levels of nitrogen, potassium and magnesium on the growth and chemical composition of the lychee (*Litchi chinensis,* Sonn.).
Diss. Abstr., 1959, **19**: 3078-9, being *L.C. Card No. Mic.* 59-1583 of 117 pp.

In greenhouse and field experiments increases of N, P and Mg in the substrate were paralleled by increases in tissue contents of these elements. Increasing N levels in the substrate significantly reduced the growth rate, slightly depressed the content of leaf K, reduced very significantly the K content of the fibrous roots, decreased Mg uptake, and slightly increased the absorption of P, but had no effect on the Ca and Na contents of the tissue. Concentrations of K and Mg in the fibrous roots were at deficiency levels even when the N supply was low, and K and Mg supplies were high. At high levels of both N and K the Mg contents of the roots were almost negligible. As the K content of the substrate was increased, the growth rate was significantly reduced, leaf N and P were increased and tissue contents of Mg and Ca were decreased, but there was no effect on Na accumulation. Increases in Mg levels increased the trunk diameters of sand-cultured trees. In spite of root deficiencies of K and Mg, leaf contents of these elements were adequate.—Ohio St. Univ.

4001. YOUNG, T. W., AND NOONAN, J. C.
Influence of nitrogen source on cold tolerance of lychees.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 229-33, bibl. 1, illus.

Young litchi trees were fertilized with 5 complete fertilizer mixtures in which the N was derived from nitrate of soda, sulphate of ammonia, ammonium nitrate, sludge, or a combination of ammonium nitrate and sludge. Each mixture was applied at 3 rates at 6-week intervals from February to November. There were no important differences in growth responses to the various treatments, but there was a definite correlation between N source and damage from a severe frost in December. The results indicate that fertilizers containing ammonium salts, or organic materials which break down to NH_4, induce some degree of cold tolerance, whereas fertilizers in which N is derived entirely from nitrate of soda increase susceptibility to frost [see also *H.A.*, 29: 2896]. The rate of application had no observable effect on frost damage.—Sub-trop. Exp. Stat., Homestead, Fla.

Olives.

(*See also* 4015a, j, l, n, p.)

4002. MILELLA, A.
Contributo allo studio delle cultivar sarde di olivo—(1) Indagini condotte in provincia di Sassari. **(Sardinian olive varieties. (1) Those of the province of Sassari.)**
Stud. sassar., Sez. III, 1957, 1959, **5**: 40-67, bibl. 37, illus.

After giving a few historical notes the author details the results of observations on the floral biology, pollination needs and agronomic characters of the varieties Tondo, Sivigliano da Olio, Corsicano, Palma and Olivastrino.

4003. ORTEGA (NIETO), J. M.
Función y forma en la poda del olivo. **(Function and form in the pruning of olives.)**
Bol. Oleic. int., 1958, **8**(47): 5-9.

The advantages of double- or multiple-trunked olive "trees" over those with single trunks are discussed. The double type is considered most satisfactory. It is produced from 2 cuttings set in the same planting hole at an angle of 45–60° with a distance of 70–80 cm. between their tops, which are preferably orientated east and west. The stems are allowed to bifurcate at 50–60 cm. above the soil, and again after further growth of 1 m. or slightly less, giving 8 symmetrically placed secondary branches. The planting holes are spaced 10–12 m. apart, or in arid regions at least 12–14 m.

4004. RENAUD, P.
À propos de la regénération de l'olivier. **(On the regeneration of the olive.)**
Progr. agric. vitic., 1959, **151**: 261-7, illus.

After being killed back to ground level by frost in 1956 olive trees on their own roots sent up suckers, which were lightly pruned and are now about to bear fruit. In 3 years these suckers have re-formed about $\frac{3}{4}$ of the volume of the original trees.—Serv. Oléotechnie (C.R.A.M.), Montpellier.

4005. BOUAT, A., RENAUD, P., AND DULAC, J.
Étude sur la physiologie de la nutrition de l'olivier. (Cinquième mémoire.) **(Study on the physiology of olive nutrition. (Fifth report.))** [English, Russian and German summaries $\frac{1}{3}$ p. each.]
Ann. agron., 1958, **9**: 193-216, illus.

Olives of 3 varieties on seedling rootstocks were planted at 400 trees per ha. and cut back to 25–30 cm., after which they were left unpruned. The fertilizer treatments were: (1) NPK, (2) farmyard manure, (3) PK, (4) NK, (5) no fertilizer. The application rates were based on the composition of leaves and twigs, and were increased annually for 4 years, being the same in the 4th and 5th years. On the NK plot the highest yield was in the 3rd year, and on all the other plots in the 4th, with a striking decline in the 5th year. Foliar analysis at flowering time showed a steady decrease in N content over the 5 years, the final value indicating distinct N deficiency. The experiment was interrupted by severe frost damage, but led to the conclusions that: (1) the low free-stem system was a means of inducing early bearing in new plantations, (2) the importance of N nutrition increased with increasing production, and (3) pruning would be advisable after 4 years. It is suggested that the productivity of frost-damaged trees could be restored by adopting this system. [For the 4th report see *H.A.*, 26: 2137.]

4006. Uriu, K.
Periods of pistil abortion in the development of the olive flower.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 194-202, bibl. 7.

A study was made in 1951 and 1952 to determine critical developmental periods of pistil abortion in the olive. To induce pistil abortion, leaves subtending the inflorescences were removed; to help prevent abortion, inflorescence buds were removed. These treatments were given at approximately weekly intervals, from flower differentiation in March to near full bloom in May. The percentage of perfect flowers was determined at full bloom. The most critical period appeared to be about a month before full bloom, when the inflorescences were about 10 to 15 mm. long and just entering the period of most rapid growth. This occurred from early to mid-April depending on the season. Treatments made after the critical period had little effect, since the number of perfect flowers was already determined. Most abortion seemed to occur when the ovaries were about 0·35 mm. long, but there was a second period of abortion of lesser intensity when they were about 0·8 mm. long. [From author's summary.]—Univ. Calif., Davis.

4007. Orphanidis, P. S., and others.
Expériences concernant l'efficacité de certains insecticides phosphorés sur le dacus de l'olive effectuées en 1957. **(Experiments on the effect of certain phosphoric insecticides on the olive fly, carried out in 1957.)**
Ann. Inst. phytopath. Benaki, 1958, **1** (n.s.): 229-89, bibl. 25.

In a detailed study carried out in Euboea, wettable and emulsifiable Rogor proved superior to the other phosphoric insecticides tested in controlling *Dacus oleae* on olives. Emulsifiable Rogor was applied at the rates of 0·3% and 0·6% and in amounts of 5·51–12·1 g. per average tree per treatment.

4008. Orphanidis, P. S., and others.
Recherches expérimentales concernant l'action systémique exercée sur le dacus par certains insecticides phosphorés à base de Phosphamidon et de Thiométon. **(Experiments on the systemic action against olive fly of certain phosphoric insecticides based on Phosphamidon and Thiometon.)**
Ann. Inst. phytopath. Benaki, 1958, **1** (n.s.): 306-13, bibl. 1.

In field and laboratory trials two phosphoric acid esters, Ciba 570 and Ekatin, did not show any systemic action against olive flies.

4009. Orphanidis, P. S., and Tsakmakis, A. A.
Recherches expérimentales sur la phytotoxicité du malathion sur l'olive. **(Experiments on the phytotoxicity of malathion to olives.)**
Ann. Inst. phytopath. Benaki, 1958, **1** (n.s.): 300-5, bibl. 6.

Wettable malathion proved less phytotoxic than the emulsifiable preparation. Sprays with a content of active substance in excess of $1^{\circ}/_{00}$ caused injury, especially in the variety Voïdolia.

4010. Orphanidis, P. S., and Adam, N. H.
Résidus de Rogor, Ekatin, Dipterex, Ciba et Nexion dans l'huile et dans les jus d'olive. **(Residues of Rogor, Ekatin, Dipterex, Ciba and Nexion in the oil and juice of olives.)**
Ann. Inst. phytopath. Benaki, 1958, **1** (n.s.): 314-19, bibl. 1.

Tabulated data show that the residues of these water-soluble phosphoric insecticides did not exceed 5 p.p.m. in the oil and were insignificant in the juice.

4011. Hartmann, H. T., and others.
Relation of fruit maturity at harvest to quality of black-ripe processed olives.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 213-28, bibl. 10.

The studies described led to the conclusion that fruit size and texture were the two most important factors in judging the optimum time to harvest olives. Harvest should be delayed as long as possible to obtain the maximum fruit size and the maximum flesh-pit ratio, yet not so long as to produce processed fruit with an unacceptably soft texture. The Christel texture meter was considered to be the most practical of the instruments tested for measuring the texture of the raw fruit as it matured, owing to its portability, relatively low cost and consistently reproducible results. Under the conditions of these studies, readings on this instrument of about 110 for Manzanillo olives, 75 for Mission olives, and 60 for Sevillano olives resulted in black-ripe processed fruits of optimum texture. [From authors' summary.]—Univ. Calif., Davis.

4012. Kamal, M. A. M., and Ezzat, M. S.
Biochemical studies on Egyptian olive oil. [Arabic summary 1¼ p.]
Ann. agric. Sci. Cairo, 1957, **2**(2): 191-203, bibl. 16, [received 1959].

Data are given on the oils of 2 varieties, Shemlali and Teffahi, of which the former proved the better for oil production in Egypt. Enzyme activity, leading to deterioration, was observed in mechanically extracted oil but not in samples extracted by means of solvents.

Opuntias.

4013. DAMIGELLA, P.
Il fico d'India e le cultivar della Sicilia orientale. **(Prickly pear and its varieties in eastern Sicily.)**
Tecn. agric., 1958, **10**: 474-502, bibl. 35, illus.

The chief reasons for cultivating these plants, which are grown from cuttings, are their capacity for breaking up the volcanic rocks with their vast root systems, their toughness and ability to withstand drought and, finally, their quite useful contribution to the fresh fruit market. They pave the way for more profitable crops such as olives and almonds. The author divides the opuntias grown in Sicily into *Opuntia ficus-indica*, *O. amyclaea*, and its variety *O. amyclaea* var. *leucosarca*. Those belonging to the first group should be used for cultivation as fresh fruit, while *O. amyclaea* var. *leucosarca* can be recommended for forming a good hedge and at the same time providing a little fruit. The types of *O. ficus-indica* can further be differentiated into those whose normal fruits have soft, mushy and dull coloured flesh and those with more solid, crisp and translucent fruits. Again, the fruits which fetch the best prices on the market are those derived from a second flowering artificially induced by removing the first flowers during anthesis. The result of this action is a second flowering some 50 days later and a second harvest, again some 50 days after that of the normal fruits, in which the fruits are of larger size thanks to the autumn rains. Descriptions are given of 9 varieties and of their first and second fruits. Attempts to use the plant for feeding cattle, for fibre and for the production of ethyl alcohol in Sicily have come to nothing.

Persimmons.

(*See also* 3374.)

4014. McDANIEL, J. C.
Aids to early fruitfulness in persimmon and pawpaw.
49th A.R. north. Nut Grs' Ass., 1958, Beltsville, Md, pp. 68-72.

The inversion of a bark ring on persimmon trees has induced earlier bearing, better fruit set and earlier maturity in some trees. When hand pollinating trees of the deciduous pawpaw, *Asimina triloba*, pollen should be applied to flowers with unopened stamens.—Univ. Ill.

Noted.

4015.

a DE ALMEIDA, F. J.
Estudios de los cultivars del olivo y la exactitud de los elementos de determinación. **(Studies on olive varieties and the precision of features for their identification.)**
Bol. Oleic. int., 1958, **8**(46): 3-10.
Recommended criteria and nomenclature.

b ANON.
Sinaasappelolie. **(Orange oil.)**
Cacao, Chocolade, Suikerwerken, 1959, **27**(1): 28-9, from *Trop. Abstr.*, 1959, **14**: 411-12.
1,000 kg. oranges yield 2 kg. oil containing 1–2% flavouring matter.

c BURKE, J. H.
Citrus industry of Argentina.
Foreign Agric. Rep. U.S. Dep. Agric. **114**, 1959, pp. 79, illus.
A comprehensive survey, mainly production and trade.

d CARLONE, R.
Importanza dell'agrumicoltura nell'economia agricola d'Israele. **(Importance of citrus growing in the agricultural economy of Israel.)**
Progr. agric., 1959, **5**: 649-60, illus.
Production and export figures, varieties, rootstocks, irrigation, products and by-products.

e CYPRUS DEPARTMENT OF COMMERCE AND INDUSTRY.
Carobs—the black gold of Cyprus.
Countryman, Nicosia, March 1959, p. 24.
Trade, composition and storage pests.

f DEBACH, P., AND LANDI, J.
California red scale parasites.
Calif. Agric., 1959, **13**(6): 9, 13, illus.
Calif. Citrogr., 1959, **44**: 290, 301–4, bibl. 1, illus.
Encouraging developments using newly introduced spp. of *Aphytis* for red scale control.

g DESZYCK, E. J., AND TING, S. V.
Burgundy—a new variety of grapefruit.
Citrus Ind., 1959, **40**(5): 5, 19.
A sport of Thomson pink seedless.

h KEENER, H. A., COLOVOS, N. F., AND ECKBERG, R. B.
The nutritive value of dried citrus pulp for dairy cattle.
Stat. Bull. N.H. agric. Exp. Stat. **438**, 1957, pp. 11, bibl. 12, illus., [received 1959].

i KROHN, E. J.
The evaluation of the use of saligna tops for citrus exports.
Citrus Gr, 1959, No. 304, pp. 6-7.
Good results obtained using box tops made of *Eucalyptus saligna* wood, cut dry.

j LAMOURIA, L. H., AND HARTMANN, H. T.
Studies of methods of harvesting olives mechanically.
Proc. Amer. Soc. hort. Sci., 1959, **73**: 203-12, bibl. 4, illus.
See *H.A.*, 28: 4042 for preliminary account.

k Levitt, E. C., and McGillivray, K. D.
Growing passion fruit.
Agric. Gaz. N.S.W., 1958, **69**: 518-24, 601-5, illus.
Varieties, establishment, trellising, cultivation, diseases and pests.

l Mársico, D. F., and Gerarduzzi, J. B.
Informe de la Primera Conferencia Internacional de Técnicos Oleícolas. (**Report on the First International Conference of Oil Technicians.**)
Idia, 1959, No. 136, pp. 1-26, illus.
Special reference to olive growing and oil technology in Spain and Italy.

m Mizuno, T., and Mikaim, Y.
Carbohydrates in the fruit of date palm.
J. agric. chem. Soc. Japan, 1958, **32**: 829-32, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-326.

n Morettini, A.
Su alcuni aspetti del'olivicoltura nella fascia litoranea toscana. (**Some aspects of olive growing in the coastal strip of Tuscany.**)
Progr. agric., 1959, **5**: 558-64, illus.
Rehabilitation of frost-damaged groves, and measures for improving groves.

o Muma, M. H.
Predators and parasites of citrus mites in Florida.
Reprinted from *Proc. 10th int. Congr. Ent. 1956*, 1958, **4**: 633-48, bibl. 29.

p Orphanidis, P. S., Karayannis, G. B., and Adam, N. H.
Recherches expérimentales sur la décomposition des résidus de parathion et de Rogor par immersion des olives dans des solutions de sels et de substances alcalines. (**Experiments on the decomposition of parathion and Rogor residues by the immersion of olives in solutions of salts and alkaline substances.**)
Ann. Inst. phytopath. Benaki, 1958, **1** (n.s.): 290-9, bibl. 1.

q del Rivero, J. M.
Transmisibilidad de la tristeza de los agrios. (**Transmissibility of tristeza disease of citrus.**)
Bol. Inst. nac. Invest. agron. Madrid, 1958, **18**: 441-55, bibl. 30, illus.
A review, including effects of controlling insect vectors.

r Volcani, Z.
Bacterial soft rot of avocado fruit. II.
Bull. Res. Coun. Israel, Sect. D, 1959, **7D**: 39-43, bibl. 9, illus.
Caused by *Erwinia carotovora* var. *aroideae*, first recorded in 1953 [*H.A.*, 25: 889].

TROPICAL FRUIT AND PLANTATION CROPS.

General.

(*See also* 4123d, 4124b.)

4016. Hanger, B. F., and others.
Notes on Kenya agriculture. V.—Plantation crops.
E. Afr. agric. J., 1959, **24**: 153-70.

Climate and soils, propagation, cultural practices, uses, etc., are briefly outlined for arabica and robusta coffee, cashew nuts, cloves, coconuts, cotton, kenaf, kapok, pyrethrum, sisal, sugar cane, tea and tobacco.

Bananas.

(*See also* 3126, 3475, 4123n, q, 4124e, j, q, 4145, 4154, 4162h.)

4017. Kebby, R. G., and Greenhalgh, W. J.
Planting distances for Cavendish bananas.
Agric. Gaz. N.S.W., 1959, **70**: 57-63, illus.

Ten years' experimental results indicated that bunch weight decreased and bunches developed more slowly as the planting distance decreased, but that total yields increased because there were more plants per acre. The highest overall yields were obtained from plants spaced at 10 × 9 ft., using the double-sucker system. This density is similar to contour planting at 10 × 5 ft. in a single-sucker system, which is gaining favour.

4018. Murray, D. B.
Deficiency symptoms of the major elements in the banana.
Trop. Agriculture, Trin., 1959, **36**: 100-7, bibl. 2, illus.

Bananas were grown in sand culture in the absence of each of the 5 major elements. The deficiency symptoms are described and illustrated in colour. The sand culture technique used is also described.

4019. Stover, R. H.
Bacterial rhizome rot of bananas.
Phytopathology, 1959, **49**: 290-2, bibl. 9, illus.

A rhizome rot of Gros Michel bananas, prevalent in most banana growing areas, was found to be incited by *Pectobacterium carotovorum* (*Erwinia carotovora*). Newly planted rhizomes and young plants less than 6 months' old are frequently destroyed, but the disease is most serious in young banana plantations 8 to 20 months old. Soils previously flood-fallowed for *Fusarium* wilt control favour development of the disease. Wounding increased disease severity; weekly applications of Agrimycin drench in greenhouse tests failed to control the disease on wounded artificially inoculated rhizomes. [From author's summary.]—Vining C. Dunlap Labs, Tela Railroad Co., La Lima, Honduras.

4020. (BLAKE, C.)
Nematodes and banana root rot.
Commonw. phytopath. News, 1959, **5**: 27.

The burrowing nematode *Radopholus similis* appears to be the organism responsible for root rot in New South Wales. Trials using hot-water treated corms for planting in nematicide-treated land are in progress.

4021. VILARDEBO, A.
Note sur la lutte contre les nématodes du bananier en Guinée. **(A note on the control of banana nematodes in Guinea.)**
Fruits d'Outre Mer, 1959, **14**: 125-6.

Tests with bananas (aged 4 months and at flowering) showed that Nemagon is not phytotoxic and is to be preferred to DD. Recommendations for its use are given.

4022. YANG, S.-F., AND HO, H.-K.
Biochemical studies on post-ripening of banana. [Chinese?]
J. Chinese chem. Soc., 1958, **5** (Ser. 11): 71-85, bibl. 23, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-278.

A study of the changes in carbohydrate metabolism and respiratory mechanism during the course of ripening indicates the existence of a transition stage between maturation and senescence, in which there is a marked and sudden rise of respiration accompanied by physiological and chemical changes. Starch is converted into sucrose and, in the post-climacteric stage, into glucose and fructose, phosphorylase being the chief enzyme involved. The respiration rate of the pre-climacteric, but not of the climacteric, banana flesh is limited by the capacity of the phosphate transfer system. Adenosinetriphosphatase develops during ripening and is apparently a factor responsible for the increase in respiration in the climacteric stage.

Cacao.

(*See also* 3475, 4123 l, u, 4124r, 4148, 4162h.)

4023. TRINIDAD AND TOBAGO.
Administration Report of the Affairs of the Cocoa Board for the year 1956, 1958, pp. 33, 70 c.

Brief reports are included on: propagation, breeding and selection of clones resistant to witches' broom, clonal trials, fertilizer trials in young and bearing plantations, chemical control of witches' broom and black pod, and shade trees.

4024. URQUHART, D. H.
Report on an investigation into the prospects for growing cocoa and oil palms in India.
[*Publ.*] *Cadbury Bros., Bourneville*, 1959, pp. 24, illus., 5s.

The development of a profitable export trade in cocoa is considered possible in Kerala, Madras and Andhra Pradesh. Basic types rather than Criollo are recommended; Amelonado, Upper Amazon and hybrids of the latter being regarded as the most promising. Considerable areas of Kerala and Tripura are also thought to be suitable for planting oil palms, using varieties imported from Malaya and Sumatra.

4025. MARTIN, E.
Preliminary studies in replanting cacao in Costa Rica.
Unpubl. Thesis Inst. interamer. Cienc. agríc., 1958, pp. 90, from abstr. in *Supl. bibl. Turrialba*, 1958, **8**(3): 41-2.

Survival of transplants after 9 months was 87% for rooted branch cuttings and 84% for seedling rootstocks. Banana plants were an economic failure when used for shading, and were replaced by *Erythrina poeppigiana*. Hedges of *Crotalaria anagyroides* were excellent for shading young plants, but costly. Grafted cuttings examined 3 months after grafting showed a 70% take. Percentages of vigorous and shapely plants were 71·3 from rooted cuttings, 65·2 from budding with chupon buds, and 63·2 from budding with fan buds. Economic aspects are also discussed.

4026. NAUNDORF, G.
Beitrag zur Frage der Selbststerilität bei *Theobroma cacao* L. **(A contribution to the problem of self-sterility in cacao.)** [English and Spanish summaries ½ p. each.]
Gordian, 1959, **59**(1405): 7-10; (1406): 8-11; and (1407): 8-11, bibl. 37, illus.

Inhibiting substances were found to be largely responsible for the phenomenon of incompatibility in cacao. Extracts from incompatible ovules in glucose agar inhibited the germination and growth of pollen tubes from incompatible trees. The treatment of such extracts with $KMnO_4$ or H_2O_2 destroyed or inactivated the inhibiting principle, and the tube growth of incompatible pollen then proceeded normally. This test permitted self-sterile cacao trees lacking visible symptoms to be quickly identified. The same pollen growth inhibitor from incompatible trees, however, stimulated the germination and tube growth of pollen from self-fertile trees. Flowers of self-sterile trees treated with $KMnO_4$ and H_2O_2 (by the hanging drop method) produced normal seeded pods after self-pollination. In certain incompatible trees the application of growth substances prior to autogamy also produced normal fruits. At times, ordinary self-fertile trees went through a period of self-sterility, but the reason for this change is unknown. Pieces of bark, containing barely visible flower cushions, taken from self-fertile trees and grafted on to self-sterile trees transformed about 20% of the treated trees into fully compatible ones which fruited and produced seeds. For the better understanding of the phenomenon of incompatibility in cacao it appears to be necessary to differentiate between different groups of self-sterility. The investigations were carried out in Colombia, where the percentage of incompatible trees is high.

4027. Orellana, R. G.
Cushion gall of cacao in Ceylon.
FAO Plant Prot. Bull., 1959, **7**: 53-4, bibl. 3, illus.

The author notes that this disease, known elsewhere as buba, verruga or agalla del cojín floral, renders the tree unproductive. It appears to be more widespread than was previously realized. It is probably systemic and induced by more than one agent. It may be a virus.

4028. Chant, S. R.
Investigations on a seedling die-back of *Theobroma cacao* L. in Nigeria.—I. Description of the disease and its spread in the nursery.
Chant, S. R., and Hall, T. H. R.
Idem.—II. Factors affecting the incidence of the disease and its control.
Trop. Agriculture, Trin., 1959, **36**: 138-44, bibl. 7, illus., and 145-9, bibl. 5.

The symptoms of a disease caused by a *Phytophthora* sp. resembling *P. palmivora* are described. Only young seedlings, less than 8 weeks old, are susceptible. Humid conditions in the nursery, dense shade and a heavy soil are predisposing factors. Seed sterilization was ineffective, but Peronox, as a 0·3 to 0·5% spray applied at 3- or 6-day intervals from 3 weeks after sowing, controlled the disease.—Moor Plantation, Ibadan, Nigeria.

4029. Spoon, W.
Cacao van het eiland Japen in Nederlands Nieuw-Guinea. **(Cocoa from Japen Island in Dutch New Guinea.)** [English summary ¾ p.]
Ber. Afd. trop. Prod. Kon. Inst. Tropen **266**, 1959, pp. 6, bibl. 7, illus.

In 1950 beans from Forastero-Criollo hybrid trees were analysed and found to be of poor quality. Trinitario beans were imported in 1954, and their analysis showed a low fat content, but an iodine value favourable for chocolate manufacture.

Coconuts.

(*See also* 4124g, i, m.)

4030. Satyabalan, K.
An easy way to get excellent coconut seedlings.
Indian Fmg, 1959, **9**: 8, illus.

If good dwarf palms are planted amongst high yielding talls, and, when bearing, their seed is planted for observation in nurseries, about 20% are likely to be found to be natural hybrids. They may be recognized by their vigorous growth and by reddish petioles if yellow or orange dwarfs are used. [See also *H.A.*, 28: 4157f.]

4031. Marar, M. M. K., and Varma, R.
Coconut nursery studies. Effects of maturity of seednuts on germination and vigour of seedlings.
Indian Coconut J., 1958, **11**: 81-6, bibl. 11.

Two experiments are described. In the first no significant differences in germination or seedling growth occurred between seed nuts that were harvested when 11, 12, 13 or 14 months' old. In the second no differences in performance were found between seed nuts from fully mature 12-month-old bunches and nuts from the next most developed bunches, which were about 11 months' old.

4032. Baseden, S. C., and Southern, P. J.
Evidence of potassium deficiency in coconut palms on coral-derived soils in New Ireland from analysis of nut waters, husks, fronds and soils.
Papua New Guinea agric. J., 1959, **11**: 101-15, bibl. 8, illus.

Productivity, from less than 5 to 60 nuts per palm, and other symptoms, such as chlorosis and smallness and sparseness of fronds, were found to be closely related to K levels. Decline of palms was not found to be connected with P levels. Nitrogen levels were high where cover crops had been established. Damage from excessive Mn was thought to be a possibility. Uptake of Na was greatest in the poorest palms and was inversely related to K uptake. Symptoms of deficiency in *Pueraria*, *Leucaena* and cacao are also discussed. The paper includes full analytical data and coloured photographs showing chlorosis due to K deficiency. —Lowlands agric. exp. Stat., Keravat, and Dep. Agric., Port Moresby.

4033. Charles, A. E.
Coconut experiment work in New Ireland. Pt. 1.—Field survey and introduction. Pt. 2.—Progress report on field trials.
Papua New Guinea agric. J., 1959, **11**: 89-94, bibl. 1, illus., and 116-20.

Areas of coconut palms in which productivity had declined are described. Two fertilizer experiments of comprehensive design, including major and trace elements and lime, were established. One on yellow-brown clay-loam showed significant but uneconomic responses to K; the other on red-brown clay-loam showed no significant differences due to fertilizers. A cultivation trial involving ploughing and disc harrowing also gave insignificant results.—Lowlands agric. exp. Stat., Karavat.

4034. Uthaman, P., and Koyamu, K.
A comparative study of the organic and inorganic potash manuring in coconut.
Indian Coconut J., 1957, **11**: 34-8, bibl. 4, [received 1959].

In an experiment to compare sulphate and muriate of potash with wood-ash, each supplying 1 lb. K_2O per tree per annum, there were no significant yield differences, but the muriate was the most, and wood-ash the least, profitable.

4035. Pandalai, K. M., Sankarasubramoney, H., and Menon, K. P. V.
Problem of seasonal foliar yellowing in the coconut palm.
Indian Coconut J., 1957, **11**: 19-28, bibl. 20, [received 1959].

Numerous reported causes of leaf yellowing are reviewed. Observations in a typical affected area indicated the presence of organic acids in the subsoil water, the pH of which was as low as 3·8. There were no differences in major nutrient contents between the soils of healthy and affected areas, but leaf analyses showed a higher K_2O/MgO ratio in yellowed foliage. This was usually below 5·0 in healthy green leaves and above 5·0 in affected leaves. The latter also had a higher amino acid content.—Cent. Coconut Res. Stats, Kasaragod and Kayangulam.

4036. Pandalai, K. M., Sankarasubramoney, H., and Menon, K. P. V.
Studies on soil conditions in relation to the "root" and "leaf" diseases of the coconut palm in Travancore-Cochin. Part IV. Total and exchangeable calcium and magnesium contents of coconut soils.
Indian Coconut J., 1958, **11**: 49-66, bibl. 28.

Soils in areas carrying diseased coconut palms generally contained less total Ca and exchangeable bases than soils carrying healthy palms. Results for Mg were inconclusive, although it is clear that the disease is influenced if soil Mg is either deficient or non-available. [For part III see *H.A.*, 27: 2852.]

4037. Marar, M. M. K.
Optimum stage for harvesting coconuts for different purposes.
Indian Coconut J., 1957, **11**: 39-47, bibl. 6, [received 1959].

Previous work on composition and yields is reviewed and the author recommends that nuts for drinking should be harvested when 6–7 months' old, for copra manufacture when fully mature at 12 months, for ball copra when they are over-mature and are falling of their own accord, and for coir fibre manufacture in addition to copra making when they are 11 months' old.—Cent. Coconut Res. Stat., Kasaragod.

4038. Varma, R.
Preliminary investigations on the durability of plaited coconut leaves.
Indian Coconut J., 1957, **11**: 29-33, illus., [received 1959].

Green leaves withered in the sun or soaked in fresh water were the least durable, green leaves soaked in salt water and unsoaked dried leaves were rather more durable, and dried leaves soaked in fresh or salt water were the most durable.—Cent. Coconut Res. Stat., Kasaragod.

Coffee.

(*See also* 3475, 4123y, z, 4124a, l, s, w, 4154.)

4039. Lains e Silva, H., and Carvalho Cardoso, J.
São Tomé e Príncipe e a cultura do café. **(São Tomé and Príncipe Islands, and coffee growing.)**
Rev. Café portug., 1957, **4**(15): 11-51, maps.

This account covers climate, soils, vegetation, coffee species and varieties, shade trees and unshaded plantations, spacing, terracing, manuring, pruning, control of pests and diseases, technology, and economics.

4040. Snoeck, J.
Le caféier d'Arabie à Rubona. **(Arabica coffee at Rubona.)**
Bull. Inf. I.N.É.A.C., 1959, **8**: 70-99, illus.

During 25 years of study at Rubona the following general conclusions have been reached: seed viability is prolonged by dressing with an organo-mercury fungicide; nursery beds are best shaded by an artificial screen placed 2·25 m. above them; seeds should not be sown in a well-manured bed; mulching the beds allows shallow sowing (0·5 cm.) giving rapid and uniform germination; nursery beds, however, should be fertilized; roots should be pruned during pricking out; transplanting with a ball of soil gives the best results and should be done at the start of the rainy season; a marked correlation exists between tree height at 18 months and tree production at 2½ years; spacing single-stemmed trees at 2 × 2 m. has given the best results; yields from multiple-stemmed trees were lower than those from single-stemmed trees in the early years of bearing, became equal after about 12 years and then exceeded them; single-stemmed trees were successfully transformed into multiple-stemmed trees by removing the lower primary branches, bending the trunk and then removing the original trunk 2 years later when the suckers were in bearing; a permanent mulch has proved the best form of soil cultivation; shade in low rainfall regions is best provided by *Albizzia stipulata*; *Antestiopsis* spp. have been successfully controlled by DDT or malathion, and *Hemileia vastatrix* by copper fungicides.

4041. URIBE URIBE, R.
Almácigos de café en bolsas de polietileno. **(Coffee nurseries in polythene bags.)**
Rev. cafet. Colomb., 1958, **14**: 301-3, illus.

The bags are filled with a mixture of soil and compost and placed under shade trees after 3–4 seeds have been sown in each. The strongest seedling developing in each bag is retained. When ready for transplanting, the seedling is released with the medium intact by slitting the bag with a razor blade. This method is cheaper, and less damaging to the transplants, than the traditional one, in which the seedlings are individually wrapped in leaves, etc., when uprooted from the nursery for transport to the plantation.

4042. PANG, O. A.
Sambungan kepelan kopi. **(Seedling grafting of coffee.)** [English translation 1¼ pp.]
Menara Perkebunan, 1959, **28**: 67-73, illus.

In this method the stem of a 50–60-day-old seedling is cut about 5 cm. above the cotyledons and inserted into a slanting incision made in a stem or branch of a stock plant some 5–8 mm. thick. After tying, the graft is covered with paraffin wax Successful grafts flowered 9 months after grafting. By dipping the whole seedling in warm paraffin wax or other similar substances, so as to deposit a film which restricts transpiration, a better take was obtained. It was also found that grafts made on suckers grew more vigorously than those made on branches.

4043. ALÈGRE, G.
Climats et caféiers d'Arabie. **(Climate and arabica coffee.)** [English and Spanish summaries ½ p. each.]
Agron. trop., 1959, **14**: 23-58, bibl. 26.

Arabica coffee needs rainfall in 2 seasons, totalling 1,200–1,600 mm., and a precipitation in the driest month exceeding 100 mm. Temperatures should average about 20° C., fluctuating ideally between 18° and 21° C. Relative humidity should average between 70 and 80% and light intensity should be high in the dry season. These climatic requirements are discussed in relation to the main French coffee growing areas.

4044. FRANCO, C. M.
Influence of temperature on growth of coffee plant.
Bull. IBEC Res. Inst., **16**, 1958, pp. 21, bibl. 3, illus.

Young seedlings of the variety Bourbon Vermelho were used in greenhouse experiments at the Californian Institute of Technology during 1956–57. Of the root temperatures used the limits were 13° and 38° C., the optimum was in the region of 26° by day and 20° by night, and 5° either way caused serious retardation of growth. A constant air temperature of 30° not only reduced growth, but induced yellowing of leaves and the growth of tumours at the bases of the stems. Cooling the stems below —2° for more than 2 hours was lethal. The absorption of all minerals was reduced at 33° and 38°. Uptake of K increased at root temperatures of 18° and 13°, but at 13° the uptake of Ca and Mg decreased markedly.

4045. DECKER, J. P., AND TIÓ, M. A.
Photosynthetic surges in coffee seedlings. [Spanish summary 7 lines.]
J. Agric. Univ. P.R., 1959, **43**: 50-5, bibl. 4.

Changes were measured in the CO_2 concentrations around coffee leaves that were isolated in air-tight chambers and subjected to short-period alterations of light and darkness. These indicated that the onset of photosynthesis was followed almost immediately by an intensification of respiration, and its cessation by a reduction of respiratory activity. The normal apparent rate of photosynthesis was thus only a fraction of the total rate.

4046. MACHADO S., A.
Estado actual de las investigaciones sobre el uso de la sombra en los cafetales. **(Present state of investigations on the use of shade in coffee plantations.)**
Cenicafé, 1959, **10**: 5-15, bibl. 12.

The *typica* variety of *Coffea arabica* was grown without fertilizers for 5 years under 3 types of shade. Average annual yields in kg./ha. were 965 under *Inga* sp., 812 under plantains (*Musa regia*), and only 422 under *Calliandria* sp. The plantains were then removed, and NPK was applied 6 times annually to half the plants in each section. Average annual yields for the unshaded crop over the next 4 years were intermediate between the high yields under *Inga*, where there was no response to fertilizing, and the low figures under *Calliandria*, where fertilizing had approximately the same beneficial effect as on the unshaded plants, i.e. a 37–38% yield increase. Yields were positively correlated with trunk diameters. In another *typica* plantation, more than 25 years' old, removal of shade from half the area led to a reduction in yield per plant and an increase in the cost of maintenance during the following year. In another experiment *bourbon* and *typica* coffee were planted with and without shade, and maintained with and without fertilizers for 4 years. On fertilized plots of *typica*, the yield was at first considerably higher in the sun than under shade, but the difference steadily decreased, giving almost equal figures in the 4th year. Without fertilizers, however, shade was better than sun for this variety. Average yields of *bourbon* were higher in sun than in shade, the difference being as high as 139·6% on fertilized plots and 71·7% without fertilizers. The yield superiority of *bourbon* over *typica* was only slight in shade, but very considerable in sun, particularly on unfertilized plots. Thus, if the traditional use of shade for coffee cultivation in Colombia were abandoned, fertilizer application would become imperative, and *bourbon* would appear to be a safer variety than *typica* in the climate of the Chinchiná area.

4047. MULLER, R.
L'ombrage du caféier d'Arabie au Cameroun. **(Shade for arabica coffee in the [French] Cameroons.)**
Le dépérissement des pisquins, arbres d'ombrage du caféier arabica au Cameroun. **(Decline of *Albizzia malacocarpa* shade trees of arabica coffee in the [French] Cameroons.)** [English and Spanish summaries, first paper ¼ p. and second 4 lines each.]
Agron. trop., 1959, **14**: 8-12, bibl. 9; and 13-17, illus.

Shade is considered to be essential, and lack of it leads to attack by *Colletotrichum coffeanum.* Too heavy shade may cause trouble with *Corticium salmonicolor.* Several shade tree species are discussed. It is claimed that by far the best is *Albizzia malacocarpa* from Colombia, and this tree should be planted in spite of its liability to disease. The second paper discusses the damage caused by the cerambycid, *Pachystola mamillata,* which bores into the trunk and large roots and causes the death of *Albizzia* trees.

4048. LAVABRE, E.
Deux dangereux parasites des "pisquins". **(Two dangerous pests of *Albizzia malacocarpa.*)** [English and Spanish summaries 6 lines each.]
Agron. trop., 1959, **14**: 18-22, illus.

Xystrocera nigrita and the more serious *Pachystola mamillata,* both pests of this valuable shade tree of coffee, are described. Recommended control measures are soil treatment with aldrin, BHC or chlordane, and applications of dieldrin or DDT emulsion to the bark.

4049. RODRÍGUEZ G., A.
Sistemas de conservación de suelos en plantaciones de café al sol. **(Systems of soil conservation in unshaded coffee plantations.)**
Cenicafé, 1958, **9**: 277-90, bibl. 18.

The desirability of changing from shaded to unshaded cultivation of coffee in Colombia is under investigation. Comparative data for 2 years on soil erosion, run-off, leaching of nutrients, and growth and yield are given for the traditional shade cultivation with [unspecified] cover crops and for unshaded cultivation with different soil-management systems. In unshaded plots cover cropped with grass or with creeping indigo, soil erosion and run-off were slight, and approximately the same as in shaded plots, but the loss of nutrients was somewhat greater. Growth and yield were highest under shade, the best results from unshaded treatments being from plots with a non-creeping indigo cover crop and from those with hedge barriers, but in the last-named system soil erosion was comparatively severe. Growth and yield were lower on creeping indigo plots than on those with hedge barriers, grass or a non-creeping indigo cover. Strip cultivation with grass resulted in the greatest run-off. If the investigations are continued, it is thought that the competitive effect of the cover crops may decrease as the coffee bushes mature. [See also *H.A.*, 28: 4085 and 29: 1901.]

4050. PARRA H., J.
El vapor fertilizante de los guanos del Tolima. **(The manurial value of Tolima guano.)**
Cenicafé, 1959, **10**: 78-86, bibl. 6.

Its chemical composition indicated that 1 ton of the guano should be equivalent to 100 lb. of 18–10–12 fertilizer. Vegetative growth of 7-month-old coffee plants in pots was significantly increased by mixing 25, 50, 75 or 100 g. of guano with the 2 kg. of low-fertility soil in each pot, the optimal addition being 75 g. Increased growth was accompanied by a decrease in the dry-weight ratio of roots to shoots. The effects were more pronounced than would be expected from the chemical composition of the guano, and are attributed to the high availability and optimal balance of N and P.

4051. FUKUNAGA, E. T.
A new system of pruning coffee trees.
Hawaii Fm Sci., 1959, 7(3): 1-3, illus.

In this new system, called the B-F system and which is essentially a form of coppicing, all the verticals of the trees in a row are dehorned (i.e. cut back to about 18 in. and renewed) every 3rd ,4th or 5th year according to the cycle adopted, and this operation is carried out in rotation throughout the plantation. The shorter cycle is recommended for the lower elevations. Impressive increases in yield are claimed, as well as greater simplicity and ease of harvesting. [See also *H.A.*, 27: 876 and 29: 2962.]

4052. GÓMEZ D., J.
Cultivo del cafeto bajo diferentes modalidades, en el departamento del Huila. **(Different systems of growing coffee in the district of Huila [Chinchiná, Colombia].)**
Cenicafé, 1958, **9**: 228-34, bibl. 10.

Annual and total yields were compared for 6 years from 6 systems. Unpruned bushes with 2 main stems per bush gave the highest total yield of 70–98 kg. per bush. The second highest (53·96 kg.) was from the Guatemalan system, in which 4 stems per bush were left for the first 3 harvests, and the best sucker on each, that developed after bending them down, retained for the following

3 years. Almost equally productive was the "rationalized free growth" system, in which 2 or 3 suckers arising near the base after bending 3-year-old stems were selected. Considerably lower yields were achieved by allowing free growth with a single main stem, topping at 1·6 m., followed by the removal of new lateral shoots every 4–6 months, and by Colombian "double pruning", i.e. retaining only the first 2 lateral branches and gradually eliminating subsequent growth toward the centre, followed by topping the 2 main branches at 1·6 m. The first-mentioned system not only gave the highest total yield, but was the only one in which there was no fall in production in the 5th year.

4053. DEVREUX, M., AND OTHERS.
Recherches sur l'autostérilité du caféier Robusta (*Coffea canephora*). (**Research on self-sterility in robusta coffee.**)
Sér. Sci. I.N.É.A.C. **78**, 1959, pp. 44, bibl. 77, illus.

In experiments with 19 robusta clones involving very large numbers of flowers (over 1,500 in 1 case) fruit set from self-pollination was exceptionally low (the highest was only 0·24%), whereas with controlled cross-pollination 30–40% of the flowers produced mature fruit. The causes of self-sterility are discussed, and it is considered to be due mainly to abnormal form and growth of the pollen tubes.

4054. ROSSETTI, V., AND BITANCOURT, A. A.
Ação deformante do 2,4-D sôbre fôlhas de cafeeiro. (**Deforming action of 2,4-D on coffee leaves.**)
Biológico, 1959, **25**: 25-7, bibl. 2, illus.

When a fungicidal spray was applied to coffee seedlings, using apparatus not properly cleansed after spraying 2,4-D on to weeds, 40% of the seedlings developed their youngest (3rd or 4th) pair of leaves with a leathery texture and long, narrow shape. In many of the affected seedlings the terminal bud became atrophied or withered. Of the 5 seedlings kept under observation, 4 produced new normal shoots 2 months after transplanting, 3 of them sending out lateral shoots at cotyledonary level, and the other growing from the terminal bud.

4055. DE FIGUEIREDO, E. R., JR., PUZZI, D., AND ORLANDO, A.
Ensaios de laboratório para verificar a eventual resistência da broca do café ao BHC. (**Laboratory tests to determine the possible resistance of the coffee borer to BHC.**)
Biológico, 1959, **25**: 21-4, bibl. 2.

Unfavourable results (reported from various sources) in controlling the coffee berry borer [*Stephanoderes hampei*] by BHC are attributed to lack of thoroughness in application and to leaving some fruit unharvested, thereby creating foci of re-infestation. Laboratory tests gave good results, which have been confirmed in the field, with 1% γ-BHC dust.

4056. ANON.
Las palomillas del café. (**Coffee mealybugs.**)
Agric. venezol., 1958, **22**(202): 19, illus.

The solution recommended for control is 100 c.c. of 60% Diazinon + 15 c.c. of 19·5% endrin in 100 l. of water, applied to the soil round the roots at 5 l. per planting hole containing 1–3 plants. Holes for transplants should be treated 5 days before receiving the plants.

4057. VICKARS, M. A., AND MESMER, E. T.
Electrostatic dusting of coffee trees in East Africa.
Misc. Rep. colon. Pest Res. Unit **227**, 1959, pp. 17.

A proprietary electrostatic power dusting machine was tested on arabica coffee, using a copper oxychloride preparation. It was found that electrostatically charged dust was more heavily deposited than uncharged dust on the front of the row of trees nearest the duster, but that there were no clear differences in succeeding rows. Electrostatic dusting did not increase the deposits on the under surfaces of leaves relative to those on the upper surfaces, nor did charged dust deposits weather better than uncharged.

4058. SKERRETT, E. J., AND BAKER, E. A.
The colorimetric determination of dieldrin in extracts of coffee bark.
Analyst, 1959, **84**: 376-80, bibl. 14.

Dieldrin is extracted from coffee bark and, after removal of interfering plant material, is converted to the corresponding ketone by the action of boron trifluoride. The 2:4-dinitrophenylhydrazone is then formed, and the red colour produced by interaction with tetraethylammonium hydroxide is measured by 440 mμ. [Authors' abstract.]—Long Ashton Res. Stat.

4059. McLOY, J. F.
Mechanical drying of arabica coffee.
Kenya Coffee, 1959, **24**: 117-33, illus.

The results of a 3-year research programme undertaken by E.A.I.R.O. are summarized. The need to remove surface water from the parchment without delay after pulping is emphasized, and criteria are given for determining under- and over-fermentation. The technique of mechanical drying worked out involves adequate light treatment to ensure good bean colour, and either pre-drying in the sun to the medium black stage, after which hot-air drying causes little loss of quality, or, if the weather is unsuitable, storage in cold-air ventilated bins until the weather improves. Layers of beans on the trays should not be more than 1 in. deep. Notes on the best method of sun drying are included, and various driers, bins and other equipment for both large and small estates are described.

4060. Calle V., H.
Tentativas para la preparación de productos alimenticios del cafeto, distintos a la bebida. **(Attempts to prepare food products, other than the beverage, from coffee plants.)**
Cenicafé, 1958, **9**: 222-7, bibl. 7, illus.

Preliminary attempts described include the preparation of a beverage from dried coffee leaves, and the extraction of molasses and production of ethyl alcohol, pectin and syrup from the pulp and mucilage of the fruit. The seeds contain about 13% of protein, and can be milled into flour after suitable treatment, one possible hydrolysing agent being a *Phytophthora* sp. This flour has good baking qualities and can be mixed with wheat flour.

4061. Martinez, C.
Dosage rapide de l'acide chlorogénique libre et combiné dans les grains de café vert. **(The rapid determination of free and combined chlorogenic acid in green coffee beans.)** [English and Spanish summaries 15 lines each.]
Agron. trop., 1959, **14**: 71-3, bibl. 9.

The titration of free chlorogenic acid, combined as potassium salt in green coffee beans, can be made directly on an ethanolic extract of coffee. Chlorogenic acid is titrated with 0·1 *N* soda at pH 6 directly on the extract, when free chlorogenic acid is desired, or after passing over ion-exchanging resin, when total chlorogenic acid is desired. [From author's summary.]

Mangoes.

4062. Mulat, B.
Greffage du manguier. **(Mango grafting.)**
Fruits d'Outre Mer, 1959, **14**: 219-23, illus.

An illustrated description is given of a successful method, developed in French Guinea, of side tongue grafting 13-month-old mango plants. Of 6,000 grafts made in June 82% were successful, and of 4,000 made between mid-August and the end of October 67% were successful.

4063. Date, W. B., and Mathur, P. B.
Preliminary studies on the refrigerated gas storage of mangoes.
Food Sci. Mysore, 1958, **7**: 283-4, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-278.

The life of mangoes is 6 to 10 weeks in cold storage, or 10 to 16 weeks in refrigerated gas storage, in which the CO_2 evolved in respiration is utilized to depress the rate of respiration of the fruits. The mangoes must be sealed up in store before the climacteric rise of respiration occurs. Rate of respiration was compared with diameter of fruit over two seasons, and it is concluded that Badami mangoes should be picked for gas storage when most of the fruits on a tree have attained a diameter of 7·7 cm., and Raspuri mangoes when they have reached 6·9 cm.

Oil palms.

(*See also* 3475, 4024, 4123h, k, 4124g.)

4064. Desneux, R.
Une méthode simplifiée pour la germination des graines du palmier à huile. **(A simplified method of germinating oil palm seeds.)**
Bull. Inf. I.N.É.A.C., 1959, **8**: 23-34, illus.

The seeds, mixed with wood charcoal, are placed in half drums (ordinary 200 l. oil or petrol drums), which are sunk in a mass of vegetable material in a deep pit. They are then covered with a layer of clay soil. The vegetable material, such as cut grass, is watered and ferments, causing relatively high temperatures. Within the drums temperatures of the order of 34 to 38° C. are reached, and germination percentages as high as 95% are obtained by the 4th month.

4065. Broeshart, H.
The application of radio-isotopic techniques to fertilizer placement studies in oil palm cultivation.
Neth. J. agric. Sci., 1959, **7**: 95-109, bibl. 3.

Top-dressings of fertilizers to oil palms gave better results than placement 5–15 cm. below the surface. For 1-year-old palms fertilizers were best placed close to the stem, inside the crown periphery. Fertilizer uptake by 2-year-old palms was about the same whether from application close to the stem or at the crown periphery. Placement of fertilizer at the crown periphery was best for 3- and 4-year-old palms, but in bearing plantations there was no optimal position. Phosphate was rapidly absorbed from foliar sprays, and the proportion of P absorbed was much higher than from soil applications. With young palms P uptake was reduced during dry periods, but this effect became less marked with age.—Huilever S.A., Belgian Congo.

Papaws.

(*See also* 3555.)

4066. Akamine, E. K.
Effects of carbon dioxide on quality and shelf life of papaya.
Tech. Progr. Rep. Hawaii agric. Exp. Stat. **120**, 1959, pp. 15, bibl. 22, illus.

At storage temperatures between 65° and 91° F., 10% CO_2 checked decay in papaws for the period of storage only. In this it was inferior to the hot-water treatment, which appreciably delayed the onset of post-storage decay. Three days after removal from storage 70% of the papaws which had received hot-water treatment were marketable, whereas all those stored in CO_2 had deteriorated.

Pineapples.

(*See also* 4145.)

4067. Wang, H., and Chang, S. M.
The distribution and features of some important types of Smooth Cayenne pineapple in Taiwan. [Chinese, with English summary 1 p.]
Reprinted from *J. agric. Res. Taiwan*, 1957, 7(1): 7-12, bibl. 12.

Of four types of Smooth Cayenne grown in Taiwan two were evaluated in 1954–56, and the "Collar of slips" type was found to be much inferior to the "Normal" Smooth Cayenne, although it occupies 95% of the planted area. The relative value of the other two strains, "Elevated eyes" and "Sarawak", of which only fractional percentages are planted, has not yet been fully determined.

4068. Wang, H., and Chang, S. M.
Experiment on close planting of pineapple (1). [Chinese, with English summary 1½ pp.]
[*Publ.*] *Taiwan agric. Res. Inst.*, 1958, pp. 16, bibl. 7.

Spacing trials were started in 1955 at 15 places in 6 districts of Taiwan. Smooth Cayenne pineapples were planted on plots of 150 sq. m. in rows 50 cm. apart, spaced to give 25,000, 30,000, 35,000, and 40,000 plants per ha. Complete records were obtained from 12 sites and showed no spacing effect on leaf number, leaf width, number of slips and suckers produced per plant, sugar content of fruit, diameter of fruit core and depth of flower cavity. Close spacing resulted in significant yield increases, the closest giving 48% more than the widest, but it reduced fruit size and weight, and retarded maturity. The percentage of 2nd and 3rd grade fruits, suitable for canning, rose from 75 in the widest to 86 in the closest spacing. These smaller, lower grade fruits canned better than large fruits, and the highest population yielded 59% more cans per hectare than the lowest population.—Fengshan trop. hort. Exp. Stat.

4069. Su, N. R., and others.
Effects of rice straw mulching on pineapples.
Soils and Ferts, Taiwan, 1956-1957, 1958, pp. 42-3, from *Trop. Abstr.*, 1959, **14**, No. g1236.

Mulching increased growth and yield, leaf size, leaf and soil moisture contents, leaf and soil nutrient contents, fruiting percentage, sucker formation and the percentage of sound fruits. The main factor responsible for such increases is believed to be the improved K nutrition of the plants.—Tou-Lin Pineapple Exp. Stat., Taiwan.

4070. Martin-Prével, P.
Aperçu sur les relations croissance-nutrition minérale chez l'ananas. **(A study of the relations between growth and mineral nutrition of the pineapple.)**
Fruits d'Outre Mer, 1959, **14**: 101-22, bibl. 12.

In this study, in which no fertilizer was compared with 2 applications of a complete fertilizer (1:1:2) or of a high K fertilizer (1:1:6), the chief effect of N was to increase fruit weight. Fruit quality, principally acidity, was most affected by high K. Leaf measurements, after showing little or no increase in the early stages of growth, rapidly increased until flowering; fertilization accentuated this increase in leaf size. Contents of, and interrelationships between, the major elements in successive "D" leaves [see *H.A.*, 29: 2990] were studied. The possibilities of using the analysis of complete "D" leaves, together with some morphological data (weight and rate of unfolding of "D" leaves), in foliar diagnosis are discussed.

4071. Hernández-Medina, E., and Lugo-López, M. A.
Effects of the calcium-boron relationship on growth and production of the pineapple plant.
J. Agric. Univ. P.R., 1958, **42**: 207-23, bibl. 15, illus. [Spanish summary 2 pp.]

Red Spanish pineapples were grown in sand culture with complete nutrients apart from Ca, which was supplied at 5, 50, 100, 250 and 500 p.p.m., and B, which was supplied at 0, 0·001, 0·25, 1·0 and 5·0 p.p.m. Yields, weights of root and shoot, and number and weight of slips were recorded. In the absence of B, plants receiving 5 p.p.m. of Ca produced more than those receiving 500 p.p.m. of Ca, thus indicating a metabolic disturbance due to deficient B and high Ca. 50 p.p.m. of Ca in the absence of B was optimal. With B at 5 p.p.m., Ca at 250 and 500 p.p.m. produced the highest fruit yield, thus indicating that high B and high Ca favour normal metabolism by comparison with low Ca and high B.

4072. Evans, H. R.
The influence of growth-promoting substances on pineapples.
Trop. Agriculture, Trin., 1959, **36**: 108-17, bibl. 3.

1-Naphthylacetic acid, Hortomone A, Seradix A and Planofix all exerted a marked influence on the fruiting and ripening of pineapples. More plants were induced to produce fruit and harvesting was advanced. Fruit weight was also increased, but, when immature plants were treated, fruit weight was reduced. 2,4-D depressed fruiting and retarded harvesting. When it was applied to immature plants, fruiting was increased and harvesting accelerated, but fruit weight was reduced. Dicotox reduced fruiting and delayed harvesting but increased fruit weight. Anapal and Tomato Set also depressed fruiting. β-Indolyl-butyric acid and acetylene, though promising, require further trial. Results obtained when the treatments were applied at different seasons indicate that higher concentrations are required during the rains, or when the plants are well supplied with moisture, than are required before the rains or when the plants are less well provided with moisture.—Dep. Agric., Kenya.

4073. Huet, R.
À propos du dosage de l'acidité du jus d'ananas. **(Concerning the determination of acidity in pineapple juice.)**
Fruits d'Outre Mer, 1959, **14**: 83-5.

In order to elucidate anomalies between the assessment of acidity by taste and by analysis, samples were taken from 4 plots of a fertilizer experiment receiving various combinations of K_2SO_4, MgO, $MgSO_4$, CaO and $CaSO_4$. Results of analyses are tabulated, showing total and free acid, ash, alkalinity of ash, pH and pK. They indicate that pH varies little in spite of differing acid concentrations due to the buffering effect of weak organic acids partly neutralized by strong bases. The measurement of free acid is insufficient evidence of acid taste, and it is desirable to make pH determinations when assessing quality.—I.F.A.C.

4074. Tisseau, M.-A.
Précautions à prendre dans la manipulation des ananas exportés en frais. **(Precautions to adopt in handling fresh pineapples for export.)**
Fruits d'Outre Mer, 1959, **14**: 79-82, illus.

The article describes metal-framed carriers for the picker's back in which 12 large or 25 small fruit can be carried without bruising. Export packs and packing are also discussed.—I.F.A.C.

Rubber trees.

(*See also* 4123b, j, t, 4124k, 4126.)

4075. Anon.
Foreign exchange clones—1954 collection.
Plant. Bull. R.R.I.M., 1959, No. 42, pp. 59-62.

Notes are given on the most promising hevea clones imported into Malaya. The best to date are WR 101, IRCI 7, and AVROS 427 from Java, Indo-China and Sumatra respectively.

4076. Tan Hong Tong, Parlindungan Lubis, and Wan Maheran.
Verslag over de toetstappingen in de APA-toetstuinen op Bukit Maradja Estate. **(Report on test tappings in the clonal test gardens at Bukit Maradja Estate.)** [English and Indonesian summaries $\frac{3}{4}$ p.]
Bull. Res. Inst. S.P.A., **23**, 1959, pp. 26.

An experiment was started in 1941 in 15 gardens, each containing 7 plots of 6 clones and a control (AVROS 49), 25 trees to each clone. Tapping began in 1948, but yield records were not taken until 1953. All high yielding clones have been found to have a high incidence of brown bast disease and to have been seriously affected by neglect in their early stages. The best clones so far are all members of the AVROS series, but none of them is ideal for Sumatran conditions.

4077. Beaufils, [E.] R.
Le diagnostic physiologique. III.—Mécanisme de' l'interprétation. **(Physiological diagnosis. III. Method of interpreting the data.)** [English, German, Spanish and Italian summaries, about 11 lines each.]
Rev. gén. Caoutch., 1959, **36**: 225-9, bibl. 6.

In this paper the author reviews the theory behind the method and, by using figures of leaf N content as an example, shows the importance of the manner in which the data are expressed and how their correct interpretation depends on it. These data are normally ratios between the contents of various mineral elements, and from them shoratges can be diagnosed. [For parts I and II, see *H.A.*, 28: 4119 and 29: 913.]

4078. Anon.
Manganese deficiency [in hevea].
Plant. Bull. R.R.I.M., 1959, No. 42, pp. 57-9, illus.

Deficiency symptoms in the leaf are illustrated in colour. Levels of leaf Mn below 50 p.p.m. indicate deficiency in young and mature trees. Symptoms have been cured by applying 4 oz. of manganese sulphate per tree, but this may be rather too liberal a dressing.

4079. Tas, R.
Les appareils à moteur dans la lutte chimique contre l'oïdium de l'hévéa. **(Powered equipment in the chemical control of hevea mildew.)**
Bull. Inf. I.N.É.A.C., 1959, **8**: 51-64, bibl. 35, illus.

The disease is briefly described, together with its control by the use of sulphur dust or Karathane. Several portable motor blowers are described and illustrated, and control by dusting is reviewed. It is concluded that, because control with portable motor blowers is expensive (and aerial application even more so), it is only justified when heavy losses are anticipated.

4080. Hilton, R. N.
Pink disease of *Hevea* caused by *Corticium salmonicolor* Berk. et Br.
J. Rubb. Res. Inst. Malaya, 1958, **15**: 275-96, bibl. 57, illus.

A detailed account is given of the etiology of this disease. Spraying with tar oil and/or bordeaux mixture remains the most effective means of control.

4081. HUTCHISON, F. W.
Defoliation of *Hevea brasiliensis* by aerial spraying.
J. Rubb. Res. Inst. Malaya, 1958, **15**: 241-74, bibl. 5, illus.

As defoliation is considered to be the only practicable method of eradicating South American leaf blight (*Dothidella ulei*), should an outbreak occur, extensive trials were carried out in 1952–53 on the aerial application of defoliants. The n-butyl ester of 2,4,5-T proved most suitable, and a 5% solution in gas oil sprayed at a rate of 3 gal./acre was the most effective dosage, one treatment keeping the trees defoliated for 4–6 weeks. Pentachlorophenol added to the 2,4,5-T at concentrations exceeding 0·01% tended to depress the defoliant effect. A separate application of 1% pentachlorophenol, one day later, at 2·9 gal./acre, was more effective as a fungicide than 0·01% added to the defoliant and had little effect on the effectiveness of the latter. Detailed information is given on 2 types of spraying apparatus and on methods of marking and controlling the spraying operation.

Sugar cane.

(*See also* 4123a, c, e, f, i, m, o, p, r, s, x, 4124d, f, h, n, p.)

4082. MAURITIUS SUGAR INDUSTRY RESEARCH INSTITUTE.
Annual Report of the Mauritius Sugar Industry Research Institute, 1958, 1959, pp. 103 + xxviii, bibls, illus, also summarized in French in *Rev. agric. sucr. Maurice*, 1959, **38**: 53-98.

Progress reports on the following are included: *Cane breeding:* arrowing, crossing, studies on seedling populations, selection and pre-release trials, and methods of cane sampling. *Nutrition and soils:* fertilization with N, P and K, foliar diagnosis results for P and K, and foliar diagnosis for N requirements. *Cane diseases:* the effect of environment on, and the mode of transmission of, chlorotic streak, varietal responses to ratoon stunting, heat treatment of cuttings, Fiji disease in Madagascar, and gumming disease in Réunion. *Cane pests:* varietal resistance to *Proceras sacchariphagus*, soil fumigation for nematode control, and control of *Clemora smithi* with chlordane. *Weed control:* investigations on the substituted ureas, control of *Cynodon dactylon* and *Phalaris arundinacea*, and the comparison of 2,4-D and MCPA derivatives as pre-emergence herbicides. *Cultivation:* organic and inorganic amendments. *Climate:* sugar yields in relation to climatic factors, and varietal resistance to cyclones. Foliar sprays of 2,4-D to increase the sucrose content of cane.

4083. ASOCIACIÓN DE TÉCNICOS AZUCAREROS DE CUBA.
Memoria de la XXXI Conferencia Anual, Asociación de Técnicos Azucareros de Cuba, 1957. (**Report of the 31st Annual Conference of Sugar Technologists of Cuba, 1957**), Havana, pp. 294, bibls, illus.

In its agricultural section, the report contains papers on: the biological control of the sugar cane borer; sugar cane pests, including nematodes; organic matter in sugar cane soils; variety trials. The section on by-products includes a paper on cellulose production from bagasse, and one on sorbitol manufacture from sugar cane. Separate abstracts appear below.

4084. HEBERT, L. P., AND HENDERSON, M. T.
Breeding behaviour of certain agronomic characters in progenies of sugarcane crosses at the United States Sugarcane Field Station, Houma, La.
Tech. Bull. U.S. Dep. Agric. **1194**, 1959, pp. 54, bibl. 19, illus.

The breeding behaviour of the progenies of 7 crosses was studied in their single stools in 1953 and as plant and first ratoon crops in 1954 and 1955. Significant positive correlations for stalk diameter were obtained within clones between single stools and plant cane, also between the first ratoon of single stools and the first ratoon of clones, and between the plant cane of clones and the first ratoon of clones. While 17% of unselected clones were commercially acceptable, selection of the single stools would have raised the proportion to 31%. A close correlation was shown to exist between the polarization and the Brix of the juice from the plant and ratoon canes of the clones, indicating that selection in a single season for either character would be effective. In general, for all the characters studied the performance of the progeny of a cross could be predicted from the performance of the parents, and no instance occurred where an inferior parent gave rise to a superior progeny or vice-versa.

4085. STEVENSON, G. C.
Sugar cane varieties in Barbados: an historical review.
Bull. B.W.I. cent. Sugar Cane Breeding Stat. **39**, 2nd edition, 1958, pp. 26, bibl. 38.

The popularity of B.37161 has declined and only 38% of the cane planted in 1958 was of this variety. Newer varieties, particularly B.41211, B.45151, B.4744 and B.49119, occupied 40% of the acreage by 1957. Recent breeding work and varietal trends in commercial planting are fully described. [For the 1st edition see *H.A.*, 24: 4366.]

4086. Méndez-Roig, F., Samuels, G., and Colón, A.
Sugarcane variety trials in Puerto Rico, 1952-57. [Spanish summary ½ p.]
J. Agric. Univ. P.R., 1959, **43**: 1-18, bibl. 2.

In the production of available 96° sugar per acre P.R. 980 was the outstanding variety in the southern, western, north-western and interior areas, B.37161 in the eastern area and Caguas valley and B.41227 in the north-eastern area. M.336, P.R. 1016, M.975 and P.P.Q.K. gave the highest percentages of sucrose-percent-cane, and P.R. 980 and P.R. 1013 ranked first in tons sugar per acre per month, P.R. 980 having an average yield of 0·645 tons per month.

4087. de Ullivarri, R. F., and Guerineau, C. M.
La importancia de las variedades de caña de azúcar de maduración temprana para la industria azucarera argentina. **(The importance of early maturing sugar cane varieties for the Argentine sugar industry.)** [English summary ½ p.]
Rev. industr. agríc. Tucumán, 1957, **41**(3): 3-30, illus., [received 1959].

Of the 8 varieties which proved superior to the local variety Tuc. 2645, the following were the most promising: C.P. 34-120, for high yields of cane and sugar; V.A. 571, for frost resistance and early maturity; C.P. 34-79, for early maturity, though in this variety yields vary; and N:Co.310, with the disadvantage of susceptibility to mosaic disease.

4088. Sreenivasan, P. S.
A series of four complete enumeration experiments for the study of germination in sugarcane by sampling.
Indian J. Sugarcane Res., 1959, **3**: 61-7, bibl. 16.

Two varieties of cane were planted on Jan. 9, 1952, in 12 plots, 48 × 48 ft. with rows 4 ft. apart. One 3-bud sett was planted to each foot-length of row. The number of eye-buds that had germinated per unit length of row was recorded on Jan. 31, Feb. 11 and 19, and March 18. The optimum sampling unit was found to lie between 6 and 12, and with 12 units or more a linear arrangement of units was more efficient than a parallel arrangement. The coefficient of variability decreased as germination advanced, and further stratification of the sampling units within plots did not appreciably reduce the variance between samples.—Agric. Met. Div., met. Off., Poona.

4089. Bernal Cerice, R.
Lluvias caídas en el central Unidad durante los últimos 32 años y sequía notable de 1956. **(Rainfall in the Unidad milling district during the past 32 years, and the severe drought of 1956.)**
Mem. XXXI Conf. anu. Asoc. Téc. azuc. Cuba, 1957, pp. 21-31.

In Cuba sugar cane grows actively from May to November, during which period 82% of the annual rain usually falls. The drought of 1956, with only 30% of the normal rainfall during the early part of the growing season, reduced sugar production by 30%.

4090. Barnes, A. C.
Notes on the irrigation of sugarcane by overhead methods.
S. Afr. Sugar J., 1959, **43**: 297-301.

Various points to be considered when overhead irrigation is contemplated are discussed, among them field lay out to allow room for, and access to, pipe lines and feeders, size of pipe lines, size and height of sprinklers, and spacing. Installations giving adequate coverage with minimum overlap are described with diagrams.

4091. Simon, E. C.
Soil productivity under a non-legume (sugar cane-corn) rotation system.
Proc. Amer. Soc. Sugar Cane Tech. 1950-1953, 1955, **4**: 1-5, [received 1959].

From 1929 to 1950 a plot of very fertile soil was regularly cropped with the minimum of organic matter added, no summer or winter legumes and only 36 lb. of inorganic N applied to each ratoon crop. A standard rotation of 3 years of cane with 1 of corn was established. Productivity remained fairly high for the first 10 years, dropped noticeably in the 1939-43 cycle and then remained fairly steady until 1950.

4092. Tandon, R. K., Agarwal, D. C., and Singh, R. P.
Sanari (*Crotalaria juncea*) as a dual purpose crop in cane rotation.
Indian J. Sugarcane Res., 1959, **3**: 72-8, bibl. 40.

Crotalaria, grown for fibre, seed and green manure, was compared with cotton (with or without a legume) grown for 1 year in a 3-year rotation with cane. The cane after crotalaria grown for green manuring and for fibre outyielded the cane following cotton by 31 and 29% respectively. The advantage was confined to the plant crop, there being no residual effect on the ratoons. A reduction of juice quality following crotalaria did not reach significance.

4093. Bhoj, R. L., and Tandon, R. K.
Mixed cropping in sugarcane in the central tract of Uttar Pradesh.
Indian J. Sugarcane Res., 1959, **3**: 93-101, bibl. 16, illus.

Mustard, peas and gram were sown as intercrops in autumn-planted cane and as separate crops preceding spring-planted cane. Autumn planting with an inter-row crop proved decidedly more profitable than spring planting with or without a previous crop. Of the inter-row crops, peas ave the best return followed by gram.—Sugarcane es. Stat., Shahjahanpur.

094. BOLAÑOS CASTELLANOS, E.
Importancia de la materia orgánica en la fertilidad de las tierras. **(Importance of organic matter for soil fertility.)**
Mem. XXXI Conf. anu. Asoc. Téc. azuc. Cuba, 1957, pp. 33-5, bibl. 5.

Velvet beans (*Stizolobium deeringianum*) are an excellent green-manure crop for sugar cane, producing as much as 300 metric tons per caballería [13·42 ha.], with a N content of about 2%. *Canavalia ensiformis* is also highly recommended. A further source of organic manure is the scum from the initial boiling of sugar cane juice, which contains small amounts of P and K in addition to N, and is best applied before planting.

095. GO BAN HONG, AND VAN SCHUYLENBORGH, J.
Leaf composition of lowland rice and sugar cane as an indicator of their performance.
Neth. J. agric. Sci., 1959, 7: 110-17, bibl. 14.

Monthly analyses for N, PO_4, K, Ca, Mg and Na were made from P.O.J. 3061 canes during growth, and foliar composition, characterized by element-concentration ratios, was taken as an index of nutrient status. The ratios of the major elements remained fairly constant throughout the growing season, and hence it is possible to use analyses at an early stage of development as an indication of subsequent performance. The ratios N/PO_4 and N/K increased with age in the stems, suggesting that N is more mobile than PO_4 or K.

096. ASHLEY, T. E., STOKES, I. E., AND ANDREWS, W. B.
Organic versus inorganic sources of nitrogen for sugar-cane production in Mississippi.
Circ. Miss. St. Coll. **205**, 1956, pp. 14.

Inorganic N, when applied not later than June, was as effective as organic N, and under some conditions caused higher juice per acre yields. Anhydrous ammonia was equal to ammonium nitrate, and there was no increase in yield as a result of split applications of either fertilizer. Higher yields per unit of N were obtained when the N was applied in a mixture with P and K than when applied alone. Juice quality was not affected by source of N or time of application.

4097. WANG, S. C., AND LI, K. Y.
Harmonic fertilization of sugarcane in Taiwan.
Soils and Ferts, Taiwan, 1956-1957, 1958, pp. 35-6, from *Trop. Abstr.*, 1959, **14**, No. g1197.

Nitrogen was found to be deficient in all parts of the Taiwan sugar cane area, and N applications were particularly effective in the warm, southern part. Potash responses exceeded those of P and, on some soils, those of N. Phosphate was most needed on acid lateritic soils. Lime and organic manure were also necessary to maintain fertility.—Taiwan Sugar Exp. Stat.

4098. BYRNSIDE, D. S., JR., AND STURGIS, M. B.
Soil phosphorus fractions as related to response of sugar cane to phosphorus fertilisation.
Bull. La agric. Exp. Stat. **513**, 1958, pp. 30, from abstr. in *J. Sci. Food Agric.*, 1959, **10**: i-297.

Sugar cane usually responded to P fertilization when the soil content of P extracted by the Bray method was less than 100 p.p.m., by the Truog method less than 50 p.p.m., or by 0·1 N-HCl less than 100 p.p.m.

4099. SHARMA, J. M., AND DHINGRA, D. R.
On the utility of press-mud as manure for sugarcane crop in the Punjab.
Indian J. Sugarcane Res., 1959, **3**: 102-5, bibl. 5.

Yield increases similar to those obtained after using ½ ton of lime per acre were obtained on calcium-deficient, leached soils when 2 and 4 tons per acre of press mud were applied.—Sugarcane Res. Stat., Jullundur Cantt., Punjab.

4100. THAKUR, C., AND NEGI, N. S.
Effect of gibberellic acid on growth, sucrose and nitrogen content in sugarcane plant.
Sci. and Cult., 1959, **24**: 522-3, bibl. 4.

Spraying potted sugar cane plants with 9 ml. of 100 p.p.m. GA resulted in increases in height, number of internodes, diameter, number of leaves, leaf area in the early stages (but a considerable decrease 7 months later), moisture percentage, dry weight of leaves, fresh weight of stalk (by over 100% in the main shoot and 17% in the tillers), sucrose percentage and brix. Purity and N content of the leaves were reduced. In the early stages the growth increases occurred chiefly in the main stem at the expense of the tillers, but by harvest time, with the exception of leaf area, both main shoot and tillers showed gains as a result of GA treatment.

4101. RAO, M. S. S., PRASAD, R. B., AND KHANNA, K. L.
Some preliminary observations on the effect of maleic hydrazide on sugarcane.
Indian J. Sugarcane Res., 1959, **3**: 68-71, bibl. 25.

Soil applications of MH at rates of 73·5, 147 and 294 p.p.m. active MH were made to Co. 513 when 3 months' old, and foliar sprays at 1·2 and 2·4 g. per clump were applied to B.O.17 when 5 months' old. Tillering was increased by soil applications but reduced by sprays; flowering was prevented by the former and greatly enhanced by the latter. Yields were highest at the 73·5 p.p.m. soil dosage, the control being second; sprays at both rates depressed yields appreciably. The results for percentage extraction and juice purity were similar.—Sugarcane Res. Inst., Pusa, Bihar.

4102. BIRD, J., CIBES, H., AND TIÓ, M. A.
Transmission of the causal agent of the chlorotic streak disease of sugarcane through the roots of plants grown in nutrient solution. [Spanish summary ¾ p.]
Tech. Pap. P.R. agric. Exp. Stat. **27**, 1958, pp. 17, bibl. 8, illus.

The results of the studies reported herein confirm the theory that healthy sugarcane plants become infected by the causal agent of the chlorotic streak disease when their roots are in direct contact with roots of diseased plants growing in nutrient solution in the same container. Evidence is presented to prove that the transmission of the causal agent from diseased to healthy plants can be effected by circulation of the nutrient solution in the absence of direct root contact. Further indications have been obtained that the agent causing this disease affects the water conducting vessels of the sugarcane plant. [Authors' summary.]

4103. LONG, W. H., AND OTHERS.
Better cane borer control in Louisiana.
Sugar J., 1959, **21**(11): 24-5, bibl. 5.

It is estimated that in Louisiana the average loss of sugar caused by *Diatraea saccharalis* since 1937 has been 13%. The control exercised by 4 fortnightly applications of 2% endrin granules at 12 lb./acre over 2nd and 3rd generation borers resulted in yield increases of about 7 to 8 tons of cane per acre, compared with increases of about 3 tons obtained with 40% ryania dust.

4104. CUETO ROBAYNA, C. B.
Control biológico del borer o perforador de la caña de azúcar (*Diatraea saccharalis*, Fabr.) por medio de la mosca cubana (*Lixophaga diatraeae*, Towns.) en el Central Baraguá. (**Biological control of the sugar cane borer (*Diatraea saccharalis*) by the Cuban fly (*Lixophaga diatraeae*) at the Baraguá Central.**)
Mem. XXXI Conf. anu. Asoc. Téc. azuc. Cuba, 1957, pp. 1-8.

Liberation of the flies in cane plantations gave very satisfactory control of the pest in 3 years in heavily infested areas, and even more rapidly elsewhere, with an increase in sugar yields. In areas where liberation of the parasites was suspended, the borer populations rose in the next 4 years to numbers above those existing before control began. Costs of control are discussed.

4105. GUPTA, B. D.
Insect pests of sugarcane in India.—1. The sugarcane root borer, *Emmalocera depressella* Swinh.
Indian Sugar, 1959, **8**: 775-82, bibl. 17, illus.

The pest is fully described. Recommended control measures include field sanitation, profuse and timely irrigation, and the application of 1 lb./acre actual BHC (1%) sprayed over the setts at planting time. Spraying the crop with endrin (0·1%) emulsion has also shown promise.—Indian Inst. Sugarcane Res., Lucknow.

4106. CANCIENNE, E. A.
Fire ant control: effects on the sugar cane borer.
Sugar J., 1959, **21**(11): 17.

A considerable build up of sugar cane borer was experienced after aerial spraying with heptachlor to eradicate the fire ant. This was attributed to the destruction of the borer's natural predators. The subsequent application of endrin to counteract this side effect is recommended.

4107. IYER, S. S.
Sampling errors in the field sampling of sugarcane for chemical analysis.
Indian J. Sugarcane Res., 1959, **3**: 90-2, bibl. 4.

In order to assess the extent to which sampling error contributed towards experimental error as a whole, duplicate samples were taken from the plots of 16 field experiments and crushed separately for juice analysis. The results indicated that sampling error was the dominant factor in most cases, and that, to obtain increased precision, it would be better to take more samples per plot than to increase the number of replications.

4108. COLEMAN, R. E.
Studies on the keeping quality of sugarcane following injury by freezing temperatures during 1950-51.
Proc. Amer. Soc. Sugar Cane Tech. 1950-1953, 1955, **4**: 29-39, [received 1959].

Burned, frozen cane deteriorated more rapidly than unburned, especially under warm moist conditions. Badly frozen, unburned cane also deteriorated more rapidly under moist conditions. Windrowed cane deteriorated more slowly, and to a lesser degree, than either standing cane or cane cut and put across the rows. The variety C.P. 44/101 kept better than C.P. 29/116.

Tea.

(*See also* 4123g, v, w, 4124c, u, v.)

4109. WIGHT, W.
Nomenclature and classification of the tea plant.
Nature, 1959, **183**: 1726-8, bibl. 21.

The problem of defining tea cultivars or jat populations is discussed, and attention is drawn to the merit of metrically defined groups or agrotypes. For this purpose the number of phloem parenchyma cells with druses of calcium oxalate in the leaf petiole (called "crystal frequency") may be used. Within the limits of 12 cultivars of var. *assamica*, the relations between crystal frequency and yield per unit area (r= −0·90), the surface area of bushes (r = 0·78), the glossy-leaf to mat-leaf ratio (r = 0·94), and quality as defined by tasting are described.—Tocklai exp. Stat.

4110. Garot, A., and Soekarno, T.
Penjelenggaraan kebun-bidji-teh baru. (**Some factors influencing the establishment of tea seed-gardens.**) [English summary ¼ p.)
Menara Perkebunan, 1959, **28**: 47-60, illus.

Good quality tea seed is in demand, since seedlings are preferred to cuttings when planting new estates. Many clonal seed-gardens have been disappointing as the clones were found to be wholly or partly self-sterile. It is recommended therefore that the fertility, as well as habit and other characters, of clones should be ascertained at 2–3 years of age. Methods of establishing seed-gardens are discussed.

4111. Pan, C. H.
Experience on the process of rooting short stem cuttings of the tea plant. [Chinese, with English summary 1¼ pp.]
Acta agric. sin., 1958, **9**: 373-83, bibl. 17.

A new method of using leaf-bud cuttings 4–5 cm. long, introduced and developed by the planters of the Anki district of Fukien, is recommended on a number of grounds. The plants remain true to type, the time of development is reduced, material is used economically and the survival rate is higher, being 90% as against 70–80% for longer cuttings. As a result of his experiments the author suggests that red soil from the lower slopes should be used for striking these cuttings, which should be taken in the spring from the current year's growth and dipped in a 50 p.p.m. solution of 2,4-D. The best variety for this purpose is U-Long.

4112. Pereira, H. C.
Soil moisture effects of crop-spacing and of shade trees in a Limuru tea garden: a progress report.
Quart. Circ. Tea Res. Inst. E. Afr., 1959, **2**(1): 4-9.

Preliminary results indicated that higher density of planting (5 ft. × 2 ft. as compared with 4 ft. × 4 ft.) resulted in a lower soil moisture content and that shade trees had a similar but smaller effect.

4113. Rogers, T. E.
Man-made rain. Overhead irrigation of tea.
World Crops, 1959, **11**: 207-9, illus.

An area of tea planted in 1949, and given annual irrigation yielded 18½ mds [1 maund = 80 lb.] per acre in 1955, while a comparable, but non-irrigated, area yielded 11½ mds per acre. No profits were obtained from the non-irrigated plantation, but a net profit of Rs. 612.50 per acre was realized with irrigation.—Empire of Ind. and Ceylon Tea Co.

4114. Gokhale, N. G.
Soil nitrogen status under continuous cropping and with manuring in the case of unshaded tea.
Soil Sci., 1959, **87**: 331-3, bibl. 4.

A manurial trial with unshaded tea has been in operation in N.E. India since 1930. The N content of the soil decreased in all treatments, but the decrease was inversely related to the rate of manuring. At the lowest rate (40 lb. of N, 20 lb. of P_2O_5 and 20 lb. of K_2O per acre annually) the decomposition of pruning litter added approximately 14 lb. of N per acre to the soil annually. An equation is given for calculating soil N at any given time during the trial.—Tocklai exp. Stat.

4115. Paravjan, A. V.
Trials on tea cultivation by coppicing under conditions of the Bostandinsk region. [Russian.]
Vestn. AN KazSSR, 1957, No. 6, pp. 60-70, from *Ref. Ž.* (*Biol.*), 1958, No. 10, Abstr. 44,363.

Methods of growing tea in southern Kazakstan and other areas in Central Asia, where temperatures drop to −20 to −25° C., were studied. Bushes, from 1 to 6 years old, were cut back in the autumn to 5, 15, 20 and 30 cm., and those of the last 3 treatments earthed up to the branches until the spring. Good results were obtained by cutting back to 30 cm., especially with older plants. Cutting back 6-year-old plants to this height resulted in the best coppice growth and in satisfactory yields.

4116. Gokhale, N. G.
Mechanization in tea in the U.S.S.R.
Two and a Bud, 1959, **6**(1): 9-11.

A self-propelled plucking machine, Ch U -1.6S, is described which will deal with up to 2·7 acres per 8-hour shift. Plucking is by means of rubber "fingers", and a degree of selective action can be achieved. Also described are attachments for light and medium pruning, numbered Ch PG-1.6 and Ch PG-1.3, and new machinery for tea factories.

4117. Ranaweera, D. J. W.
Acaricidal trials against the scarlet mite, *Brevipalpus australis* Tucker, on tea.
Tea Quart., 1958, **29**: 125-8, bibl. 2.

In randomized trials 4 heavy spray treatments with sulphur, starting a month after pruning, and the removal of the old leaves after the third application were more effective than 18 light spray applications of chlorobenzilate combined with Perenox in reducing the mite population at the 6th month after pruning. There followed a build up of mites until their number equalled those on the control by the 15th month. No alteration in yield was recorded, and no general defoliation was observed. [For earlier work see *H.A.*, 26: 4247.]

4118. JUDENKO, E.
The appearance of adult shot-hole borers (*Xyleborus fornicatus* Eich) outside their galleries under natural conditions.
A note on the distribution of the entrances to the open galleries made by shot-hole borer (*Xyleborus fornicatus* Eich) on tea.
Preliminary small-scale field experiments on a chemical method for the prevention of shot-hole borer (*Xyleborus fornicatus* Eich) attack on tea in plucking.
Tea Quart., 1958, **29**: 104-11, bibl. 2, illus.; 112-14, bibl. 1; and 115-24, bibl. 11, illus.

The first two papers describe studies on the behaviour of the adult beetles designed to provide information on which control measures might be based. The third paper describes a trial in which chlordane at a strength of 3·75% active ingredient and dieldrin at 0·5% a.i. were used to spray bushes averaging 3 ft. in height at 6 in. (110 gal. per acre) and 12 in. (245 gal. per acre) above ground level. No significant differences were found in the effects at the two heights, and in both cases there were marked reductions in the numbers of live adults up to 9 months after treatment. No injury to the tea was observed. [See also *H.A.*, 29: 960u.]

4119. WOLF, F. T.
The chlorophyll content of tea.
Bull. Torrey bot. Cl., 1959, **86**: 184-9, bibl. 6.

Spectrophotometric analysis of chlorophylls *a* and *b* in 75 samples of processed tea revealed the following average contents: Green teas contained 1·39 mg./g. total chlorophyll (of which 81·1% was chlorophyll *a*), oolong teas 0·82 mg./g. (78·5%) and black teas 1·01 mg./g. (70·9%). A sample of fresh tea leaves from Florida contained 65·4% chlorophyll *a*.—Vanderbilt Univ., Nashville, Tenn.

Sundry crops.

(*See also* 4124o, t.)

4120. LANDRAU, P., JR., AND HERNÁNDEZ-MEDINA, E.
Effects of major and minor elements, lime and soil amendments on the yield and ascorbic acid content of acerola (*Malpighia punicifolia* L.).
J. Agric. Univ. P.R., 1959, **43**: 19-33, bibl. 16, illus.

Acerola or West Indian cherry trees, grown on a sandy clay soil (pH 4·5), gave significant yield increases when treated with N, P and K, and the maximum rate applied, 200 lb./acre, significantly increased the ascorbic acid content of the fruit. N, P and K levels in the leaves and the number of fruits were positively correlated with yield and ascorbic acid content, but fruit size was negatively correlated with these. Lime benefited root development, as also did the maximum NPK application. Minor elements and soil amendments failed to increase yields and reduced the ascorbic acid content.

4121. PATEL, G. I., AND RAO, K. S. N.
Important diseases and pests of arecanut and their control.
Arecanut J., 1958, **9**: 89-96, illus.

Three fungus diseases, fruit rot (*Phytophthora* sp.), root rot (*Ganoderma lucidum*) and stem bleeding (*Thielaviopsis paradoxa*) are described, control in each case being effected by bordeaux or a similar copper/lime fungicide. Mention is made of 3 physiological diseases, stem breaking, band disease and nut splitting. Mites are the major pests, causing yellow leaf disease; they can be controlled by wettable sulphur sprays or lime-sulphur dust, although recent work has shown spraying with Folidol, Systox or Ekatin to be still more effective A certain amount of root damage is caused by the grubs of a beetle, which can be checked by the soil application of lead arsenate, DDT or chlordane.

4122. LEWIS, Y. S., AND NEELAKANTAN, S.
Synthesis of tartaric acid in tamarind leaves.
Curr. Sci., 1959, **28**: 152-3, bibl. 7.

The tartaric acid content of the leaves of *Tamarindus indica* is at a maximum in April/May, declining steadily throughout the year as it is translocated to the developing fruit. It is suggested that the acid is an end degradation product of glucose, which does not undergo further metabolism in the plant.—Cent. Food Tech. Res. Inst., Mysore.

Noted.

4123.

a AGARWAL, R. A.
Insect resistance in Coimbatore canes—a review.
Indian Sugar, 1959, **8**: 785-96, bibl. 62.
Including notes on the main pests and the behaviour of commercial cane varieties.

b ANON.
Nurseries: establishment and maintenance.
Plant. Bull. R.R.I.M., 1959, No. 42, pp. 52-6.
For clonal hevea seedlings, budded stumps and budwood.

c ANON.
Variedades de cana "CB" (Campos-Brasil) no Irã. **(CB sugarcane varieties in Iran.)**
Brasil Açucareiro, 1958, **52**: 148, from *Trop. Abstr.*, 1959, **14**: 404.
CB 36-14 from Campos, Brazil, has performed well under extreme climatic conditions in Iran.

d Barrau, J.
A reconnaissance survey in the field of economic botany in Western Melanesia.
Rep. S. Pacific Commiss., 1958, pp. 60.
Including lists of economic plants observed in Netherlands New Guinea, British Solomon Is., Papua and New Guinea.

e Barreto Domínguez, R.
Resultados obtenidos en los estudios comparativos de variedades realizados por la Estación Experimental de la Caña de Azúcar de Jovellanos en zafra de 1957. **(Results of comparative variety trials conducted by the Jovellanos Sugar Cane Experimental Station in the 1957 cropping season.)**
Mem. XXXI Conf. anu. Asoc. Téc. azuc. Cuba, 1957, pp. 37-43, bibl. 2.

f Breaux, R. D., and others.
Sugar cane breeding and selection.
Sugar J., 1959, **21**(11): 21-3.
At Louisiana State University.

g Das, G. M.
Problems of pest control in tea.
Sci. and Cult., 1959, **24**: 493-8, bibl. 10.
A review, including problems of toxic hazards, tainting, pest resistance and predator destruction.

h Desneux, R., and Rots, O.
Vers une exploitation plus intensive et plus rationnelle des palmeraies subspontanées du Kwango. **(Towards a more intensive and profitable exploitation of the semi-wild oil palm groves of Kwango.)** [Flemish summary 4 pp.]
Bull. agric. Congo belge, 1959, **50**: 295-328, bibl. 9, illus.
The area described, and the technical feasibility of further exploitation discussed.

i Dugas, A. L.
The sugarcane borer problem in Louisiana today.
Status of sugar cane insect problems in Louisiana.
Proc. Amer. Soc. Sugar Cane Tech. 1950-57, 1957, **5**: 8-17, 43-51.
Recommended control measures against *Diatraea saccharalis* and some minor pests.

j Evers, E.
Un outil pratique pour enfoncer les gouttières dans le tronc d'un hévéa. **(A practical tool for driving metal spouts into hevea trunks.)**
Bull. Inf. I.N.É.A.C., 1959, **8**: 134-5, illus.

k Ferrand, M.
Instrucciones generales para la selección de terrenos para palma africana. **(General instructions on land selection for the oil-palm.)**
Bol. Divulg. Inst. Fomento algodonero, Colombia, 1958, **5**: 9 from *Trop. Abstr.*, 1959, 14: 412.

l Fincke, H.
Von den Mitscherlich'schen Körperchen um mikroskopischen Bild des Kakaosamens. **(The Mitscherlich bodies of cacao seeds under the microscope.)**
Gordian, 1959, **59**(1404): 14-16; (1405): 11-12, bibl. 7, illus.

m Foster, C. B.
The yield of sugar cane in Barbados in 1957.
Bull. Dep. Sci. Agric. Barbados **26**, 1957, pp. 25.
An analysis of acreages, varieties, ratoons and yields for areas according to rainfall and soils.

n Griffiths, L. A.
Detection and identification of the polyphenoloxidase substrate of the banana.
Nature, 1959, **184**: 58-9, bibl. 6.
The natural precursor of the black pigment in oxidized banana tissue shown to be 3,4-dihydroxyphenylethylamine.

o Gupta, B. D., and Avasthy, P. N.
Some recommendations for the control of sugarcane pests in India. Part I. The sugarcane leaf hopper *Pyrilla perpusilla* Wlk.
Indian J. Sugarcane Res., 1959, **3**: 79-83, illus.
BHC dust, and DDT, BHC, toxaphene, endrin and malathion sprays recommended.

p Gupta, M. C., and Gupta, B. D.
Insect pests of sugarcane in India—II. The pink borer, *Sesamia inferens* Wlk.
Indian Sugar, 1959, **9**: 15-18, bibl. 10, illus.
Life history and control.

q I.N.É.A.C.
Le "bunchy top" du bananier. **(Bunchy top disease of bananas.)**
Bull. Inf. I.N.É.A.C., 1959, **8**: 131-4, illus.
Description and control by destroying infected plant material.

r Jamasji, R. S.
Cultivation of sugarcane in the Deccan.
Indian Sugar, 1959, **8**: 667-72, illus.
Improved yields attributed to deeper cultivation and more adequate fertilization.

s Lauden, L. L.
A report on the progress of the control of stunting disease.
Proc. Amer. Soc. Sugar Cane Tech. 1950-57, 1957, **5**: 22-9, illus.
Designs and operational temperature records for 2 hot-air chambers.

t Lloyd, W.
Il caucciù. Uno sguardo al passato, al presente e al futuro. **(Rubber. A glance at the past, the present and the future.)**
Riv. Agric. subtrop. trop., 1959, **53**: 127-41.
Trends in world production and consumption since 1939 discussed.

u Lockard, R. G., Vamathevan, P., and Thamboo, S.
Swellings on the shoots of cacao plants deficient in copper.
Nature, 1959, **184**: 75-6, bibl. 3, illus.
Observed in sand culture after 273 days: swellings were due to increased xylem thickness.

v Macalpine, R. I.
Cultivation *vis-à-vis* green crops in young tea.
Two and a Bud, 1959, **6**(1): 17-19.
Green crop management to enable surface scraping to replace deep hoeing.

w Macalpine, R. I.
Planting of shade [for tea].
Ser. Tea Res. Inst. Tocklai **12/1**, 1959, pp. 10.
Shade tree arrangements and planting distances.

x Melis, W., and Stewart, C. W.
Evaluation of sugar cane varieties, season 1954.
Proc. Amer. Soc. Sugar Cane Tech. 1950-57, 1957, **5**: 103-14.
Milling and analytical data for C.P. 44-101, C.P. 44-154, C.P. 47-193, C.P. 48-103 and N:Co. 310.

y Melville, A. R.
Control of agricultural pests.
Coffee and Tea Ind., reprinted in *Kenya Coffee*, 1959, **24**: 81-5, bibl. 21.
Biological control methods for coffee pests reviewed with special reference to the coffee mealybug.

z Mendes da Ponte, A.
Viagem de estudio a alguns países cafeeiros das Américas do Sul e Central. **(Studies on coffee growing in some countries of South and Central America.)**
Rev. Café portug., 1958, **5**(18): 5-36, bibl. 14, illus., and **5**(19): 12-53, bibl. 10, illus.
S. Paulo (Brazil) and Venezuela.

4124.

a Mes, M. G.
Estudios sobre la florescencia del *Coffea arabica* L. **(Studies on the flowering of *Coffea arabica*.)**
Bull. IBEC Res. Inst., **14**, 1958, pp. 41, bibl. 35, illus.
A Spanish translation of papers previously published in English [see *H.A.*, 28: 1875, 3074].

b Mohrmann, J. C. J.
Some aspects of sprinkler irrigation in tropical regions.
Neth. J. agric. Sci., 1959, **7**: 118-33, illus.
See *H.A.*, 29: 859.

c Myers, M., and Roberts, E. A. H.
Some trace constituents of black tea.
Chem. Ind. Lond., 1959, No. 30, pp. 950-1, bibl. 7.
5,7-Dihydroxycoumarin, (—)-epiafzelechin, phloroglucinol., pyrogallol and other, unidentified, compounds.

d Narayanaswamy, P. S., Kalyanaraman, V. M., and Subramanian, T. R.
A note on the sugarcane scale *Targionia glomerata* G. and its control.
Indian J. Sugarcane Res., 1959, **3**: 105-6, illus.
Folidol and Systox at 1 oz. in 6¼ gal. water gave appreciable control.

e Page, O. T.
Fusaric acid in banana plants infected with *Fusarium oxysporum* f. *cubense*.
Phytopathology, 1959, **49**: 230, bibl. 4.
Chemistry of detection in rhizome sap.

f Pramanik, B. N.
Behaviour of some important cane varieties from sugar manufacturing point of view.
Indian Sugar, 1959, **9**: 19-28.
Of 8 varieties tested the best were Co.S.522, Co.S.521 and Co.S.519.

g Prevot, P.
Oléagineux tropicaux et oligo-éléments. **(Tropical oil-producing plants and minor elements.)**
Oléagineux, 1959, **14**: 371-5, bibl. 16.
A short review, including Mn, Cu and B nutrition of oil palms and coconuts.

h Ramp, R. M.
Sugarcane planter development in Louisiana.
Proc. Amer. Soc. Sugar Cane Tech. 1950-57, 1957, **5**: 37-42, illus.
Description and design of a machine capable of planting 2–3 acres per day.

i Rao, A.
Pilot sample survey for estimating area and yield of coconut in Mysore state.
Indian Coconut J., 1957, **11**: 1-18, [received 1959].
Details of a survey method using villages as sampling units.

j Rowan, K. S.
Uridine diphosphoglucose in banana fruit.
Biochim. biophys. Acta, 1959, **34**: 270-1, bibl. 13.
This intermediate in sucrose synthesis identified in Cavendish banana fruit prior to commercial ripening.

k Rubber Research Institute of Ceylon.
Brown rot disease of hevea, *Fomes noxius*. Bark rot and canker of hevea, *Phytophthora palmivora*. The phytophthora leaf disease of hevea, *Phytophthora palmivora*.
Advis. Circs Rubb. Res. Inst. Ceylon **63, 64** and **65**, 1958, pp. 2, 3 and 4.
Biology, recognition and control measures.

l dos Santos Oliveira, A.
Organoléptica do café. (**Organoleptics of coffee.**)
Rev. Café portug., 1958, **5** (18): 59-82 and **5**(19): 54-89, illus.
Methods of assessing flavour and aroma, and composition of raw and roasted coffee beans.

m Sekhar, P. S.
Studies on the cockchafer, *Leucopholis coneophora* Burm., a pest of coconut palm and other intercultivated crops.
Indian Coconut J., 1958, **11**: 67-80, bibl. 3, illus.
Studies on the insect but not on its control.

n Sharma, S. L.
Abnormalities in sugarcane.
Indian J. Sugarcane Res., 1959, **3**: 106-8, bibl. 1, illus.
Cases of abnormal growth following smut infection and of abnormal arrowing described.

o Sutardi Mangundojo, R. G.
Penjelidikan mengenai penggerek polong *Crotalaria juncea* L. di Djawa. (**Studies on pod borers infesting *Crotalaria juncea* in Java.**) [English summary 4½ pp.]
Pemb. Balai Besar Penjelidikan Pertanian **152**, 1958, pp. 101, bibl. 40, illus.
Including control by predators and parasites and by timing planting.

p de Ullivarri, R. F.
Panorama de la industria azucarera argentina. (**Review of the sugar industry in Argentina.**)
Rev. argent. Agron., 1958, **25**: 179-94.
Production, economics, payment systems, cane varieties.

q United Fruit Company.
Problems and progress in banana disease research.
[*Publ.*] *United Fruit Company*, Norwood, Mass., 1958, pp. 36, bibl. 86, illus.
Fusarium wilt, leaf spot, bacterial wilt, infectious chlorosis and miscellaneous fruit, root, rhizome and pseudostem diseases.

r U.S. Dep. Agric., Foreign Agricultural Service.
World cocoa bean production up in 1958-59.
Foreign Agric. Circ. U.S. Dep. Agric. **FCB 1-59**, 1959, pp. 12.
Now estimated at 1,925 m. lb., 10% above 1957-58 production.

s U.S. Dep. Agric., Foreign Agricultural Service.
1958-59 world coffee crop estimate lowered slightly.
Foreign Agric. Circ. U.S. Dep. Agric. **FCOF 1-59**, 1959, pp. 12.
To 58·6 million bags.

t Ventura, M. M., and Hollanda Lima, I.
Free amino acids of cashew apples (*Anacardium occidentale* L.).
Phyton, 1959, **12**: 31-4, bibl. 5.

u Wight, W., and Dutta, K. N.
Practical basis of high yielding tea.
Reprinted from *Tea Trade Ind.*, December, 1956, pp. 4, bibl. 5, [received 1959].
Detailed fertilizer recommendations based on 80 lb. N plus 160 lb. each of P and K per acre.

v Wight, W., and Gokhale, N. G.
Longevity of the tea plant and the rational use of tea garden land.
Reprinted from *Commercial Times, Calcutta*, 1955, **11**(5): 22-8, [received 1959].
With reference to planting and re-planting policy in India and Ceylon.

w Zamacona, J. U.
Practices and problems of coffee culture in the Philippines.
Araneta J. Agric., 1958, **5**(4): 42-50.
Shade, seed selection, fertilization, pruning and processing.

NOTES ON BOOKS AND REPORTS.

Books.

4125. Brouwer, W.
Die Feldberegnung. (**Sprinkler irrigation in the field.**)
DLG-Verlag, Frankfurt/Main, 4th edition, 1959, 9 × 6½ in., pp. 248, bibl. 408, illus., DM. 19.80.

The use of the German term "Beregnung" for sprinkler irrigation is regretted in view of the confusion it has caused with growers and research workers. For, as is shown, the effects of natural rain on crop and soil differ greatly from those of sprinklers. When rain falls, for instance, the sky is overcast and the air is humid, whereas sprinklers are often used in full sunshine.

That irrigation is profitable for many crops in most years, even in our latitude, is common knowledge to-day. But it has been left largely to the author both to define the stages of growth at which 46 individual agricultural and horticultural crops will benefit from a large supply of water and to specify those other stages at which irrigation is likely to be harmful. As it is not possible to provide optimum conditions throughout the growing season, it is important that those periods, during which the influence of water on yields is greatest, should receive special attention.

Other subjects discussed at some length include types of equipment, irrigation needs, many kinds of waste water, frost control and economics. There is a combined subject and author index and a bibliography containing 408 almost exclusively German titles. Beyond doubt, this book, which has been fully revised and enlarged, deserves wide recognition as a textbook on the cultural and technical aspects of sprinkler irrigation.

V.H.G.

4126. Hilton, R. N., and Hoh Choo Chuan
Maladies of hevea in Malaya.
Rubber Res. Inst., Kuala Lumpur, Malaya. 1959, 11 × 8½ in., pp. 101, bibl. 41, illus., \$30 (Malayan), or \$20 (Malayan) in countries contributing to Malayan Rubber Fund.

The subject matter of this superbly produced book is confined to diseases and to maladies of non-parasitic origin: it is not concerned with pests. Its purpose is to enable the practical rubber planter to recognize and identify each disease so that he can intelligently set about controlling it. This is not a high-brow scientific textbook, but it is a thorough, readable, simple and practical handbook.

After an initial chapter on plant diseases in general no less than 41 maladies, to which the rubber tree is heir, are dealt with individually, although conveniently grouped under the part of the plant affected—diseases of the root, stem and branches, tapping panel and so on. Each malady is simply described with brief notes on symptoms, cause, spread, prevention and treatment. No attempt is made to detail all the latest control measures. It is essentially a recognition manual that will not date, and in the foreword the author points out that the advisory articles, which appear from time to time in the Planters' Bulletin of the R.R.I.M., provide what is needed in the way of up-to-date information on disease control techniques. This descriptive manual should therefore be regarded as complementary to these articles.

Perhaps the chief attraction of the book is found in the very beautiful watercolours of Hoh Choo Chuan which illustrate each disease. Clarity and scientific precision go hand-in-hand with brilliant draughtsmanship and colouring in a manner seldom equalled and never excelled. G.E.T.

4127. International Potash Institute.
Potassium symposium 1957.
International Potash Institute, Berne, [1959], 9 × 6 in., pp. 420, bibls, illus., Fr. (Swiss) 20.

Of the 16 papers read at this 4th Congress of the Institute, held in Vienna, 12 deal with grassland problems and 4 with Austrian agriculture.

4128. Kohnke, H., and Bertrand, A. R.
Soil conservation.
McGraw-Hill, New York, Toronto, London, 1959, 8 × 6 in., pp. 298, bibls, illus., 52s. 6d.

In their preface the authors write: "It is the purpose of this book to provide a clear picture of the fundamental nature and cause of soil erosion, of the aims of soil conservation, and of the methods of saving the soil and of maintaining its productivity. It is not the purpose of the book to give recipes for soil management, but to help the reader to understand the soil and what happens to it under various forms of land use, so that he himself can work out the solution of any soil-conservation problem."

Primarily designed as a college textbook, the authors begin with an account of soil conservation as a problem of humanity and then proceed to give a general description of soil formation and structure. These two subjects are discussed in a very simple and straightforward manner. There follow chapters on "soil erosion", the "aims and principles of soil conservation", "special soil conservation problems" (e.g. flood control, farmyards and roadsides), the "economics of soil conservation", "farm planning for soil conservation", and, very briefly, "the future of land management". As is only right and proper in a textbook the going tends to get heavier as the story unfolds. But the process is so gentle, and the different steps are explained so clearly, that the student, who does not dip or skip, should have no difficulty in following it. If, despite this, he does experience some difficulty, there are numerous clear and pertinent illustrations and many well chosen tables and graphs to assist in making the facts and figures a reality.

In case the horticulturist, who claims, perhaps justly, to be the most advanced of all farmers, asks in what way soil conservation concerns him, he might turn with advantage to the picture of rill erosion in a strawberry field on page 54 and to a table on page 114, which shows that, of all crops, those commonly described as row crops protect the soil least from erosion.

G.K.A.

4129. Lyall, H. G.
Hardy primulas.
Collingridge, London, 1959, 8½ × 5½ in., pp. 88, illus., 25s.

Those who have seen the author's annual exhibits of hardy primulas at the Chelsea Flower Shows will realize that there cannot be much that he does not know about these plants. Were further proof needed, this book provides it. The object here is more to assist beginners than to cater for advanced growers; thus the species and varieties discussed are those that anyone prepared to search commercial catalogues can secure without much difficulty. Having secured them, the problem too often is how to keep them. The instructions here provided should, if followed, improve their chances. Different species have different requirements but not so very different. Dappled shade (as opposed to gloom), freedom from drought and a neutral soil with a good supply of humus will take care of practically everything except a very few rabid calciphiles.

The opening chapter deals briefly with primroses, polyanthus and auricula, which will support sunnier situations than the rest. The mystery surrounding the trade production of those giant show polyanthus with trusses the size of footballs and flowers bigger than half-crowns, which can be relied on never to give a repeat performance after purchase, is revealed as an arduous specialist job, which only a poly-fanatic would undertake for fun. There is a chapter on the classification of primulas by sections. For the purpose of this book these are reduced from a botanical 30 to a horticultural dozen. From two chapters on soils and manures we learn that the more humus the better, that inorganic manures are deadly to the primula family, and that it is not really necessary to procure yak dung from Tibet, as one enthusiast for the Himalayan species is reported to have done. The common cow will do as well. Incidentally, the author thinks that the absence of cow manure from modern gardens is one reason why most of the old fashioned double primroses have become so difficult to grow. Other chapters deal with the treatment and planting of various garden sites, bog, wild and rock gardens and a peat wall, with a few hints on the alpine house, and, of course, propagation. Over 100 true species are described apart from hybrids and cultivars. The book is well illustrated with some of the more spectacular species. It must be a poor garden that has no corner where some sort of primula will not thrive.

G.St.C.F.

4130. McQuown, F. R.
Intelligent gardening.
Collingridge, London, and Transatlantic Arts Inc., New York, 1958, 8½ × 5½ in., pp. 116, illus., 18s.

For those who garden as a hobby, this book provides numerous hints on how to get the best out of time and money spent in the garden. The author, writing in a somewhat chatty style, starts unconventionally with weeds and then proceeds to bedding plants, roses, soil improvement, hardy annuals, perennials and bulbs, shrubs, grass, and garden design. One may perhaps conclude from the photographs of the author gardening in his jacket, that his labour-saving methods are very successful.

E.M.J.N.

4131. Marshall, T. J.
Relations between water and soil.
Tech. Commun. Bur. Soils, Harpenden, **50,** 1959, 10 × 7½ in., pp. 91, bibl. pp. 13, illus., 20s.

This T.C., which is written "from the standpoint of the agricultural use of soils", will greatly assist to bridge the gap between the known facts of the physics of soil-moisture relations and the understanding of these facts by biologists and agronomists attempting to elucidate the relationship between the plant and soil moisture. Of most practical use are probably two chapters dealing respectively with the "Availability of water for plants" and the "Measurement of water content and suction *in situ*". The latter chapter is commended particularly to those intending to attempt soil moisture measurements. Chapters on water retention, permeability, distribution of water and diffusion of water vapour, and also on salt movement and tillage effects combine to make this publication a very comprehensive account of the subject of soil-moisture relations. An excellent coverage of the literature with numerous references and a well prepared list of contents and index add enormously to the value of the T.C. for use by the plant investigator.

J.E.G.

4132. Randhawa, M. S.
Flowering trees in India.
Indian Council of Agricultural Research, New Delhi, 1957, 11 × 8½ in., pp. 210, bibl. 71, illus., Rs. 15, $5 or 39s.

In this charming book, painter, poet, administrator and horticulturist are met together in a festival of flowering trees. Its major purpose is to provide both the incentive and the technical "know-how" to town planners and all concerned with the lay-out of gardens, villages, public and private buildings and parks. This book is evidence of a laudable concern with the need for beauty in everyday life, a need which can largely be met by planting decorative trees. There is a frank acknowledgement that much of India's countryside is dry and denuded of beautiful vegetation and that many dull and drab towns and villages need aesthetic improvement. This is, of course, true of almost every tropical country and many temperate ones too. The appeal of this book is, therefore, far wider than the author intended, and its study and the application of its principals can be commended to administrators in all rapidly developing lands.

Following several delightful chapters, in which the author discourses on the beauty of trees and flowers and on trees in India's art and poetry, he turns to the practical problems of planning and landscape gardening with trees. He moves by stages from home gardens and villages to town roads, highways and great cities, and provides much to stimulate those set in authority, who, it must be confessed, are usually too concerned with important but mundane matters to give sufficient attention to what in this book are called "bioaesthetics". There is a valuable section here on national tree festivals and on how the idea of the Arbor Day or Tree Planting Week may be used with profit.

Finally, the later chapters provide lists of trees, with descriptions and notes on their care. These are most useful, and in them the romantic rubs shoulders with the scientific, as for example in the fairly close juxtaposition of lists and trees suitable for moonlit gardens and notes on the mineral constituents and nutritive value of palatable fodder trees.

A major attraction consists of 38 beautiful reproductions of paintings of trees. These are by several artists—a minor irritant is the difficulty of discovering who painted which picture—and they range in style from the strictly botanical to the mildly impressionist. In these pictures can be seen not only the intrinsic beauty of tropical flowering trees, but also something of the dawning realization of tropical peoples of their natural heritage. This unusual book will do much to foster a real appreciation of the beauties of the countryside, and future generations will be the richer for it.

G.E.T.

4133. RUHLAND, W., AND OTHERS (EDITORS).
Handbuch der Pflanzenphysiologie. Band XVII. Physiologie der Bewegungen. Teil 1. Bewegungen durch Einflüsse mechanischer und elektrischer Natur sowie durch Strahlungen. **(Encyclopedia of plant physiology. Vol. 17. Physiology of movements. Part 1. Movements due to mechanical and electrical stimuli and to radiations.)**
Springer-Verlag, Berlin, Göttingen and Heidelberg, 1959, 10 × 6½ in., pp. xvi + 716, bibls, illus., DM. 216 (subscription DM. 172.80).

The subject of plant movements being so extensive, Vol. 17 of this encyclopaedia is being published in 2 parts. The German sections include: the action of wound stimuli; seismo- and thigmo-reactions (special pollination mechanisms and movements of touch-sensitive leaves); phototaxis of chloroplasts and micro-organisms; light responses of leaves; and diurnal movements in plants. Contributions in English include: electronasty, electrotropism and galvanotaxis; light and carbon dioxide in stomatal movements; and phototropism in higher and lower plants. The one French contributor writes on tactile organs, with special reference to tendrils. [For other volumes in this series see *H.A.*, 29: 975 and 1992 and earlier.

4134. SKINNER, H. T. (EDITOR).
Garden plants in color. Vol. I. Trees, shrubs, vines.
Sweeney, Krist and Dimm, Portland, Oregon, U.S.A., and distributed in Great Britain and the Commonwealth by W. H. and L. Collingridge, London, 1958, 11 × 8½ in., pp. 86 of text + 438 coloured illustrations, $42.50 or 15 guineas.

The price of this book indicates that it is something out of the ordinary, and so it is. It is the first volume of an ambitious series intending to provide photographic illustrations in colour of all, or at least all the more commonly grown, ornamental plants that are available in the commercial nurseries of the U.S.A. The present volume is composed of 8 sections dealing respectively with trees, deciduous flowering shrubs, evergreen shrubs, azaleas, camellias, rhododendrons, coniferous evergreens, and vines (in the American sense) and ground cover plants. To each section there is an introduction by some recognized authority in that particular branch.

However, it is by the colour plates that the book will be judged. Of these there are 438, most of them extraordinarily good. The majority have been taken specially for this book, and in each case care has been taken to select a worthy specimen, the photographer assigned, it is inferred, sitting beside it day and night until the plant is at its photographic best and the light just right! The photographs in the tree section are particularly attractive. Here each tree is shown standing clean cut in a beguiling garden, often with a charming architectural background, the lawns are neatly mown, the sun is shining, the Cadillac must be just round the corner. These enviable aspects of gracious living are less evident in the shrub sections, for there the focus is more on flower than form. The flowers fill the picture and backgrounds are excluded. Many of the shrubs, particularly the deciduous, are well known in British gardens, but the object of the book is to show easily obtainable plants rather than rarities. The camellia section has 71 illustrations which, even if there are 2,500 named varieties, seems to be rather overdoing it, the family resemblances being so strong. Just as at night all cats are grey, so to the botanist all azaleas are rhododendrons, even in daylight. In this book the editor, while not contradicting this, avoids involving his non-scientific readers in botanical tangles by firmly inserting the 71 camellias between the azalea and rhododendron sections, ensuring that here at least the twain shall never meet. The conifer section depicts some 39 varieties. Dissimilar types having been chosen, monotony is absent.

Appended to every illustration is a brief description, a note on the most suitable soil and site and an estimate of the degree of hardiness. There is a zone map of the U.S.A., showing geographic areas differentiated on a basis of average minimum winter temperatures, so that with the aid of the hardiness figure given for each plant the coldest limits of likely performance can be estimated. It may be mentioned, however, that the cold tolerance of Scottish heather or ling, *Calluna vulgaris*, is given as 0° C. Unless this is a misprint the editor can hardly have experienced a Scottish winter. A number of other plants, our common holly among them, known to withstand severe cold in Great Britain are here quoted as border-line cases at 0° C. or above. The introduction to each section deals with its subject very thoroughly. That for deciduous shrubs, for example, comprises siting for effect, culture, planting, care in after years and pruning. Line drawings of do's and dont's enliven the lecture. Other section introductions are on the same lines. The book should be of real value to North American nurserymen for whom it is primarily intended. As an example of book making it must earn the highest possible praise for those who carried it out.

G.St.C.F.

4135. Withner, C. L. (Editor).
The orchids: a scientific survey.
The Ronald Press Company, New York, 1959, 9 × 6 in., pp. 648, bibls, illus., $14.00, being *Chronica Botanica New Series* **32**.

The large family of the orchids, with probably some 10,000 species, is of considerable horticultural importance and of great botanical interest. The orchids owe their horticultural value to the wide range of flower shapes, sizes and colours, to many of them being amenable to cultivation, though the majority need hot-house conditions in temperate climates, and to the duration of their flowers for weeks or months so long as they are not pollinated. An added interest to the specialist is that many of the species and even genera can be hybridized one with another to produce viable offspring. Botanically, the very great variation in flower structure, unusual features in vegetative anatomy, and peculiarities in physiology, especially in seed germination and in the general occurrence of mycorrhiza, have attracted many research workers. An up-to-date survey of our knowledge of the family is therefore likely to be of value both to horticulturists and to botanists.

This handsome volume, edited by Professor C. L. Withner, contains articles by sixteen contributors and deals with many of the problems connected with the investigation and cultivation of orchids. Of particular value to research workers are the bibliographies at the end of every chapter. There are also many useful illustrations. Most of the subjects are dealt with scientifically rather than from practical horticultural standpoints, but, since there is no hard and fast line between theory and practice in horticulture and since a high proportion of the species studied have been investigated in cultivation, the orchid grower will find much of interest and use in all the articles.

The editor provides a preliminary chapter on the history of orchid cultivation from early to recent times, and a summary account of the classification of orchids outlines the work of the more prominent taxonomists who have specialized on the group. The developmental anatomy of an orchid is based on the detailed study of one plant *Cattleya* × Trimos. A more general article is that dealing with aspects of variation in the Orchidaceae, with numerous black and white illustrations. The scheme of reference to these drawings could have been simplified and improved with advantage. The scales of enlargement appear to have been missed out for plate 59, figure 31, and the text reference on p. 150 to the figure may be misleading. The series of illustrations give an idea of the range of variation, particularly in floral organs to be found in the Orchidaceae. The embryology and development of the orchids are considered in a separate chapter and again the differences found in species, genera, and tribes are noteworthy. The importance to plant breeders of chromosomes and other microscopic features of cell contents is now generally recognized, and orchids have several features which makes their cytology of special interest. A considerable amount of knowledge on the subject has been accumulated as is indicated in the article entitled "Orchids and cytology" and in the second appendix which lists the recorded chromosome numbers in orchids with references. There is also given as Appendix IV, an outline account of the smear technique for chromosome counts in orchids.

As with many other groups of cultivated plants artificial hybridization has become a widely used method of raising new variants since John Dominy flowered the first artificially produced orchid hybrid (*Calanthe* × *dominii*) in 1856. The article dealing with hybridization and inheritance contains a great many interesting facts and comments, many of which should be of use to the breeders of orchids. A correction is needed on p. 279 where it is said that "Ames (1946) estimated that there were 3,770,000 seeds in a single capsule of *Cynoches chlorochilon*". The estimate was made by Dr. Scott at Kew and the figures were published by R. A. Rolfe in the Kew Bulletin 1909, p. 200.

The physiology of orchids is considered in three articles; one dealing with the subject generally, a second concerned with the mycorrhiza of orchids, and a third giving details of the photoperiodic and temperature responses of orchids. The natural association of orchids with a fungus, from the time of seed germination onwards, has long been known, but even now the symbiotic balance is not fully understood. For the so-called saprophytes the tendency now is to regard the orchid as parasitic on the fungus. Some fungi, however, are quite definitely parasites on orchids, and these, together with some bacteria that are disease producers, are discussed, together with control measures. A very instructive article deals with virus diseases and another with orchid pests and their control. The only orchid genus of more than minor commercial value, apart from those grown as decorative subjects, is *Vanilla* from tropical America. Three species are economically important, and cultivation is mainly concentrated in Madagascar and other islands in the Indian Ocean, French Oceania, Mexico and the West Indies. A special account of "the orchid of commerce" brings together a great deal concerning the morphology, physiology and cultivation of vanilla.

In the Appendix I there is a "Key to the orchids", but this title is only approximate since the key, essentially based on Schlechter's classification, is to the tribes and subtribes, not to the genera and still less to the species. Mention must be made of the recipes for orchid culture media and nutrient solutions given in Appendix III. Indexes are provided to plant names, persons, and subjects.

W.B.T.

4136. WORTHEN, E. L., AND ALDRICH, S. R.
Farm soils: their fertilization and management.
John Wiley, New York, and Chapman and Hall, London, 5th edition, 1956, 8½ × 6 in., pp. 439, bibl. 31, illus., 40s.

This book is designed for students, farmers, and those engaged in farm services. Its attributes are a curious mixture of opposites. It is essentially an elementary textbook, indeed many of the simplest matters are explained with almost tedious thoroughness, yet its scope is most comprehensive, and it would be difficult to name any branch of soil science which has not been dealt with quite adequately. It is essentially American—it deals in detail with the soils and climate of the American states and with American crops, equipment and problems—yet the fundamentals of soil science are so described that agricultural students everywhere will find it of great value both for reference and for general reading. Although the use of the second person and chatty style may irritate some readers, it is exceptionally readable. There is a wealth of excellent pictures and diagrams, although some perhaps are unnecessary, such as those of hands grasping the soil that feeds us, farmer and son gazing broodingly over the heritage of future generations and so on. The chapters cover the expected range—fertilizers, organic matter, lime, water management, rotations and crop needs—and there is a strong and admirabl bias towards soil conservation. Such subjects a soil maps, land judging and how to buy a farm make unusual reading in such a book.

The production of the book is excellent. There i an adequate index, but only a very limited biblio graphy. It is clearly of particular value to th American reader, but it is nevertheless a boo which any agriculturist anywhere could profitabl consult.

G.E.T.

4137. YAPP, W. B., AND WATSON, D. J. (EDITORS)
The biological productivity of Britain.
Inst. Biol., London, 1958, 8½ × 5½ in., pp. xii + 128, bibls, 25s.

In this, the seventh of a series of symposia, the Institute of Biology presents 13 papers by leadin biologists, and also a record of discussions on thei subject matter, which comprises land use, agricultural productivity, fisheries, forestry, wate control, upland development, and unconventiona ways of producing foodstuffs.

Annuals and reports.

(*See also* 3543.)

4138. BUNDESANSTALT FÜR QUALITÄTSFORSCHUN GEISENHEIM. (SCHUPHAN, W.)
Bundesanstalt für Qualitätsforschung pflanzlicher Erzeugnisse (BAQ), Geisenheim Rheingau. Tätigkeitsbericht 1958/59.
(**Annual Report of the Federal Institute fo Quality Research in Plant Products, Geisenheim, for 1958/59**), 1959, pp. 31, bibl. 31.

Research work included studies on the followin problems: *Localization of essential amino acids i plants:* In food plants protein of high biologica value was found to be concentrated in certai tissues for which the name "vital zones" (Vitalzonen) is proposed. Head formation, shade o industrial dusts all reduced the content of essentia amino acids in cabbages, savoys and spinach *Effects of insecticides on food plants:* Carrots, the seeds of which were pelleted with aldrin and dieldrin, contained concentrations of the insecticides, which much exceeded the tolerance limit. By contrast, the insecticidal treatment of onion and cauliflower seeds had no deleterious effect. The manuring of carrots with an aldrin-fertilizer mixture proved harmful. Feeding experiments have been begun to study the effect of insecticides on the food value of cabbage. Two applications of 0·3% E605 appeared to reduce the nutritional value of spinach. The response of experimental animals to the treatment of tomatoes with growth substances is recorded. *Manuring and biologica value:* Experiments were carried out in chambers guaranteeing uniform environmental conditions with corn-salad (*Valerianella olitoria*) and spinach as test plants. In the case of corn-salad, crude protein increased with rising applications of N, but the biological protein value decreased. Higher light intensities caused a rise in the biological value of the protein. With spinach manuring with P did not clearly affect the biological protein value, but the ascorbic acid content, which was subject to fluctuations, was highest at optimum levels of P supply. Increasing applications of K raised the nitrate content of spinach, which is undesirable, potassium sulphate having a greater effect than potassium chloride. The oxalic acid content, on the other hand, was reduced by increasing supplies of K. The provision of higher light intensities reduced the nitrate content. A study is being made of the loss of valuable constituents from certain vegetables and soft fruits stored under different conditions. In preliminary trials conducted in 12 localities spring-grown spinach had a much lower oxalic acid content than autumn-grown spinach.

4139. CAWTHRON INSTITUTE.
Annual Report of the Cawthron Institute 1957-58, 1958, Nelson, N.Z., pp. 55.

Work on the following problems of horticultural interest is summarized: *Hop Research* [see also abstract 3822]: The effect of 5 sources of N on cone composition; the effects of 6 fertilizer treatments on yields and cone composition; application of B, Mg and Mo and their effect on cone composition; Mo deficiency treated by soil applications; cone growth; carbohydrates of the inner woody core of hop roots; cone analyses; and nutrition in relation to black root-rot. *Tobacco Research* [see also abstract 3728]: Spacing and irrigation experiments; studies with B, Cu, Mn, Zn and Mo; foliar sprays of P and K; variety trial and breeding material; diseases (collar-rot and kiln decay). *Fruit Research:* Investigations on bitter pit. *Tomato Research:* Studies on control of cloud and blossom-end rot. Short signed articles on the mineral and N content of Cox in relation to the incidence of bitter pit, growing raspberries, the nutritional problems of tomatoes, factors affecting yield, quality and physiological disorders of tomatoes, and liquid feeding of tomatoes by trickle irrigation have been abstracted separately.

4140. COMMITTEE OF PRIVY COUNCIL FOR AGRICULTURAL RESEARCH.
Report of the Agricultural Research Council for the year 1957-58, H.M.S.O., London, pp. 172, 8s.

Introductory chapters relating to various activities and to administration and finance are followed by reviews, dealing with, among other things, fertilizer placement, chemical weed control and trace element deficiencies. The report concludes with a synopsis of the work carried out at some forty institutes or units under the control of the A.R.C.

4141. CYPRUS (HIRST, H.).
Annual Report of the Department of Agriculture for the year 1958, 1959, pp. 64.

Experimental work on a limited scale is being carried out at the deciduous fruit stations (Galata, Saittas and Trikoukkia), the sericultural station (Galata) and the tobacco station (Akradhes). Other projects include studies of certain viticultural and weed control problems. Collections of pistachio, carob and almond varieties have been established. The production of early cucumbers with the aid of polythene strips has proved promising.

4142. ELECTRICAL RESEARCH ASSOCIATION.
Thirty-eighth Annual Report for the year ended 31st December 1958, 1959, pp. 103, illus.

On pp. 39-40, there are brief reports on the use of supplementary lighting for raising tomatoes and bedding plants and for forcing bulbs, on heating a small glasshouse with floor warming, and on shading glasshouses with a green dye. Results were negative in a small-scale trial in which tomatoes were grown in a soil through which pulse-currents were passed.

4143. FORESTRY COMMISSION.
Report on Forest Research for the Year ended March, 1958, H.M.S.O. London, 1958, pp. 191, illus., 9s. 6d.

The growing of forest trees is the business of this report, but the following items may be of interest to horticulturists: the long-term storage of conifers; manuring of seedbeds; sowing techniques with silver fir, oak and beech; spray irrigation of Sitka seedlings; weed control in seedlings with chemicals and by hand; the storage of young plants in polythene bags; the effects of the duration of root exposure while transplanting seedlings; the protection of direct-sown seed by patch spraying with bitumen emulsion; the induction of flowering in larch by training branches downwards, and in birch seedlings by continuous long-day treatment; shelterbelt research; and the use of toxaphene and endrin for the control of long-tailed voles.

4144. GEISENHEIM (STEINBERG, J.).
Hessische Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau, Geisenheim (Rheingau). Bericht für das Rechnungsjahr 1957/58. (**Annual Report of the Hessian Horticultural College and Research Station at Geisenheim for 1957/58**), 1959, pp. 111, bibls.

Investigations reported include: *Department of Botany, etc.:* The effect of pollination by bees on the yield of gooseberries; fertility and sterility in varieties of acid cherries, plums and damsons. *Department of Plant Diseases:* Vines: biology and control of peronospora, progress in botrytis control. Fruit: *Ceratitis capitata* and *Stereum purpureum:*

Ornamental plants: biology of *Pestalotia versicolor* on erica; control of *Fusarium oxysporum* on statice. *Department of Soils and Plant Nutrition:* Ion exchange and availability of nutrients; nutrition of *Erica gracilis*; mulching of cucumbers; nutrition of black currants and vines. *Department of Vine Breeding and Propagation:* Tests of rootstocks in several areas; a new method of training to bring about the horizontal growth of shoots at a uniform height; soil covering in the nursery with a movable layer of plastic foil resting on wires 40 cm. above the ground. *Department of Viticulture and Wine Making:* Manuring, spacing and rootstock trials; costs of production. *Department of Fruit Growing:* Propagation by root cuttings of apple varieties to be grown on their own roots; pruning trials, confirming the desirability of pruning lightly; date of walnut propagation; strawberry and black currant varieties; black currant pruning; breeding of dwarfing and hardy apple rootstocks with a good anchorage; breeding of new apple varieties. *Department of Horticulture:* Variety trials with chrysanthemum, begonia and petunia; trials with azalea, involving irrigation with water of different degrees of softness, different nitrogen fertilizers and two media, viz. peat and pine needle litter. *Department of Vegetables:* Variety trials with glasshouse and outdoor tomatoes, cucumbers, capsicums, lettuces and cauliflowers; balata pots for raising early (glasshouse) tomato seedlings; Jiffy pots for various vegetables, which were found to save space; infrared radiation of vegetable seedlings, which accelerated their development in comparison with normal heating; spacing of celeriac; soil fumigation for the control of cork root of tomatoes; soil heating for chicory. *Department of Experimental Ecology of Cultivated Plants:* The inhibitory effect of walnut trees on the growth of plants surrounding them was shown not to be due to an excretion of the roots, but to the presence of juglone and other compounds in the leaves and male inflorescences. These inhibitors reach the soil both in drips from the foliage and by decomposition of the fallen catkins and leaves. Reports are also included from the *Departments of Garden Design, Management* and *Agricultural Meteorology*.

4145. INSTITUT FRANÇAIS DE RECHERCHES FRUITIÈRES OUTRE-MER (I.F.A.C.).
Rapport annuel 1957. (**Annual Report of the French Institute for Overseas Fruit Research, 1957**), Paris, pp. 107, illus.

This report covers the central I.F.A.C. station at Foulaya, regional stations in the Ivory Coast (Azaguie), Cameroons (Nyombe), central Congo (Loudima) and the West Indies, and the date palm station at Kankossa. Progress is reported on investigations on the following: *Bananas:* disease and pest control, particularly leaf spot disease and nematodes; spacing and sucker control trials; fertilizer and weed control experiment
fruit studies. *Pineapples:* growth studies; varie
and fertilizer trials; weed control, particularly
Imperata cylindrica; flowering control; packin
Date palms: agronomic observations; pest a
disease control. *Other fruits:* agronomic a
processing studies with citrus, mangoes, avocadoe
etc.

4146. LOS ANGELES ARBORETUM.
Annual Report of Los Angeles State an
County Arboretum, 1957-58, pp. 60, illu

Research is outlined briefly on pp. 41–4. T
application of GA to the growing apex of la
slipper orchids resulted sometimes in the produ
tion of a 2nd flower from a leaf bract and elong
tion of plant internodes. It also increased ge
mination in seeds of certain [unnamed] wild flowe
especially the older seeds. Indoleacetic acid a
indoleacetonitrile and a growth inhibiting su
stance were found in oranges. A study is
progress to find new fire resistant and droug
resistant plants for re-forestation of the Southe
California mountain slopes. The use of a portab
fire tunnel for testing plants is illustrated a
described.

4147. MACHLIS, L., AND TORREY, J. G. (EDITORS
Annual review of plant physiology, Vol. 1
Annual Reviews, Inc., Palo Alto, Cali
1959, 9 × 6 in., pp. 483, bibls, $7.00 U.S.A
$7.50 elsewhere.

This year's volume includes articles on the followi
subjects of horticultural interest: Foliar absorptio
of mineral nutrients, by S. H. Wittwer and F.
Teubner; Leaf proteins, by N. W. Pirie; T
structure of the chloroplast, by J. J. Wolke
Active transport of salt into plant tissue, by G.
Laties; Respiratory mechanisms in higher plant
by D. P. Hackett; Photoperiodic control of flor
induction, by J. Doorenbos and S. J. Wellensie
Fat metabolism in higher plants, by P. K. Stum
and C. Bradbeer; Physiology of virus disease
by F. C. Bawden; Plant chemotherapy, by A.
Dimond and J. G. Horsfall; The macronutrie
elements, by T. C. Broyer and P. R. Stout; Nitro
gen nutrition, by R. H. Burris; Metabolism
carbon compounds, by M. Gibbs; The chemic
regulation of growth (some substances and extrac
which induce growth and morphogenesis),
F. C. Steward and E. M. Shantz.

4148. MALAYA (HEATH, R. G.).
Annual Report of the Department of Agr
culture, Federation of Malaya, for 195
1958, pp. 108, illus.

Cacao: For the first time a Malayan Trinitar
strain outyielded Amelonado. The hybrid Amel
nado × Nanay 32 was proving more vigorous tha
interplanted Amelonado trees. Leaf analyses ha
shown the elements concerned in die-back to

Ca, Mn, and possibly Fe. *Coconuts:* An obscure, but lethal disease of unknown cause has been under observation in Johore. *Fruit:* A 0·3% dieldrin spray failed to reduce fruit borer and fly attack on citrus, but DDT fog checked serious damage to rambutans by noctuid larvae. *Oil palms:* Aerial spraying of endrin, while not giving adequate control of bag worms, was the best method so far tried. *Pineapples:* Apart from a reduction in size, little difference could be found in the characters influencing commercial value between parent and ratoon crops up to, and including, the fifth ratoon. *Tea:* The result of 26 months' plucking at the Experimental Station did not reveal any reduction in yield which could be attributed to blister blight. *Tobacco:* Soil treatment with DD reduced the incidence of bacterial wilt and produced a marked increase in the growth of surviving plants.

4149. New York State Horticultural Society.
Proceedings of the 104th Annual Meeting of the N.Y. St. hort. Soc. 1959, 1959, pp. 270.

At least a third of this volume is concerned with the solution of problems of the business side of horticulture, which concern marketing, sales, advertisement, co-operation and future demand. Bulk harvesting is regarded rather gingerly. The rest is concerned with the ordinary cultural operations as they affect the individual orchardist with particular reference to local conditions. An article is included on the research of the New York State Agricultural Experiment Station and the interrelations between Cornell University at Ithaca and the State Station at Geneva. [See also separate abstracts.]

4150. North of Scotland College of Agriculture.
Investigations, Research and Field Trials, 1959-60, 1959, pp. 63.

Brief notes on the following items are included: Further work on carrot fly control; variety trials with raspberries, black currants, strawberries, tomatoes, carrots, early cabbages, brussels sprouts; and soil sterilization with sodium-n-methyl dithiocarbamate.

4151. Northern Nut Growers' Association.
49th Annual Report of the Northern Nut Growers' Association 1958, pp. 127, illus.

As usual this report contains a number of interesting papers, several of which are abstracted separately. A short account is also given of a collection of *Asimina* (temperate papaw) species and hybrids at the Blandy Experimental Farm, University of Virginia.

4152. Republic of Ireland.
27th Annual Report of the Minister for Agriculture 1957-58, Dublin, Govt Publs Sale Office, 1959, pp. 176 + 82, 8s. 6d.

Peatland Experimental Centres: Exploratory trials on the utilization and fertilization of peatland for growing crops, including small fruits and vegetables. *University College, Dublin:* Plants of Brompton stock infected with a flower-breaking virus were much more susceptible to frost than were healthy plants. Observations on apple scab and mildew control. Brussels sprouts breeding. Cabbage variety trials. Iron deficiency in tomatoes grown on alkaline soil was corrected by frequent sprays of 0·2% iron citrate solution, but a more satisfactory commercial treatment appears to be the use of a peat mulch impregnated with iron sulphate and applied early. Tomato leaf mould was satisfactorily controlled by maneb.

4153. Rothamsted (Lawes Agricultural Trust).
Report of the Rothamsted Experimental Station for 1958, Harpenden, 1959, pp. 283, 10s.

Separate abstracts from this report will be found in the appropriate sections. The subjects include: N nutrition of kale; vitamin C and growth of Chinese cabbage; biological assay of growth substances; production of gibberellin by beans; counting of leaf cells; leaf expansion affected by kinetin and gibberellin; pectinase as a growth substance; effects of *Agropyron repens* on growth of vegetables; leaf mitochondria; extraction of edible protein from weeds; apple scab infection forecasting; *Fusarium* resistance in peas; ornamental hosts of crucifer clubroot; control of broad-bean aphids; biological pest control in mustard and other cruciferous crops; seed treatment with insecticides; earthworm populations in orchards; bolting in beet; a new variety of Jerusalem artichoke.

4154. Tanganyika.
Annual Report of the Government Chemist 1958, 1959, pp. 11, 2s.

Studies on the minor element nutrition of various crops have included: *Coffee:* relationships of Ca and B with flowering and fruiting; yield increases (up to 50%) after B, Zn and Ca applications; Ca/B and Fe/Mn ratios varied markedly in good and bad coffee. *Pyrethrum:* July–August flowering was improved by a March application of potassium sulphate; Zn may also be important for flowering; foliar applications of Ca and Mg were made to pyrethrum growing in soils low in these elements. *Bananas:* poorly cropping bananas showed low leaf K, B and Fe, and possibly Mo.

4155. Thies, W. H.
Report to the Government of Syria on the horticultural situation with recommendations for improvement.
Rep. FAO **840**, Rome, 1958, pp. 23.

The chief crops covered are apricots, apples, pistachio and olives. Appendices deal with pistachio pollination and chlorosis problems.

4156. Thrower, L. B.
Report to the Government of Indonesia on horticultural production and research.
Rep. FAO **1029**, Rome, 1959, pp. 88, bibl. 67.

Recommendations cover extension work, supplies of equipment, etc., to farmers, marketing, research, plant introduction and quarantine. Those fruit and vegetable crops to which particular attention should be paid are listed. The report also includes detailed proposals for dealing with citrus decline, which, it is suggested, is due to the combined effects of a nematode and a virus. Possibly the surest means of control will be the use of nucellar seedlings.

4157. U.S. Dep. Agric., Forest Service.
Annual Report of the Lake States Forest Experiment Station for the year 1958,
1959, pp. 64 + xii, illus.

The report includes a brief note on the production of Christmas trees in Wisconsin. Balsam fir [*Abies balsamea*] is the species most commonly grown for this purpose, and recently pine has outnumbered spruce. Growth-cycle studies on sugar maple are briefly noted.

4158. Wädenswil (Kobel, F.).
Jahresbericht 1956/1957 der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil. **(Annual Report of the Wädenswil Horticultural Research Station for 1956-57.)**
Landw. Jb. Schweiz, 1959, **8**: 55-175, bibl. pp. 9, illus.

Physiology and breeding: Breeding of top fruits, small fruits, vegetables and vines; nutrient requirements of top fruits and vines; growth substance treatment of apple rootstock clones, with special reference to time of treatment; frost hardiness of ornamental shrubs; control of autumn colouring in vines by spraying with MgO; leaf analysis for diagnostic purposes; determination of magnesium; the choice of basic values in determining seasonal variations in nutrient content [see abstract 3259]; seasonal changes in the mineral content of fruit trees; physiological changes in stored fruit; temperature measurements in vineyards. *Plant protection:* Testing insecticides and fungicides; a warning service against fruit pests; forecasting grape berry moth incidence; entomological studies on several horticultural pests, including the biology and control of *Otiorrhynchus sulcatus* on vines; virus diseases of top fruit and strawberries; dieback of erica roots due to N manuring which kills the mycorrhiza; soil sickness in pansy due to *Thielaviopsis basicola* and controlled by fumigation with DD; grey mould of vine. *Fruit and vegetable utilization:* Storage of apples, pears and cherries. *Pomology:* Rootstocks for fruit trees; deficiency symptoms in orchards and nurseries; manurial trials; locality as affecting tree growth;
prevention of damage by spring frosts; bienn
bearing in pome fruit; control of fruit drop in ch
ries by spraying with α-naphthylacetic acid; wal
grafting; orchard costs. *Viticulture and oenolog*
Variety trials; nutrition; labour-saving methods
cultivation and pruning, with tabulated data
labour requirements, yields and quality; spray
equipment; rootstocks; spring frost control
irrigation. *Market gardening:* Vegetable varie
trials.

4159. West of Scotland Agricultural Colle
Report of the Work of the College for t
year ended 30th September, 1958, 1959, pp. 8

Work in the horticultural department (pp. 44–6)
very briefly reported, and mentions the followi
subjects: breeding tomatoes for resistance to le
mould; management, yields and returns fro
tomatoes: response of a tomato variety to d
length; early- and late-flowering chrysanthemu
trials; fruit and vegetable trials; black polythe
mulch for weed control; pre-emergence weed co
trol with IPC and CIPC; and the application
gibberellin to horticultural plants.

New periodicals.

4160. Biological Institute, Czechoslovak Ac
demy of Sciences.
Biologia plantarum, [*Biol. plant., Pragu*
1959, Vol. I, No. 1, $9\frac{1}{2} \times 6\frac{1}{2}$ in., pp. 8
illus., Artia, Smečky 30, Praha 2, Czech
slovakia, Kčs 30 per year or Kčs 7.50 p
number.

The sub-title of this new journal is "Journal
Experimental Botany", and its primary aim is
bring the work of Czechoslovakian scientists in t
botanical field to the notice of others at home a
abroad. The journal is to appear quarterly, and
of the 10 articles in the first number have be
abstracted as being of distinct horticultural intere

4161. Kemmer, E., and others.
Der Erwerbsobstbau [*ErwObstb.*], 195
Vol. 1, No. 1, $11\frac{1}{2} \times 8\frac{1}{2}$ in., pp. 24, bibl
illus., Verlag Paul Parey, Berlin and Ha
burg, monthly, DM. 12, plus postage, sing
numbers D.M. 5.

The journal is devoted to the more importa
aspects of commercial fruit growing in weste
Germany, its board of editors being composed
6 directors of fruit research institutes. The fi
number includes E. Kemmer, F. Hilkenbäume
P.-G. de Haas and G. Liebster among its cont
butors. The journal will specialize in the public
tion of pomological papers, with the particul
object of forging a link between science and co
mercial practice. Abstracts and reviews will al
be included covering foreign as well as Germ
literature on fruit growing.

Noted.

4162.

a Arizona.
Annual Report of the Arizona Agricultural Experiment Station for the 68th year ending June 30, 1957, 1958, pp. 19, being *Bull.* **295.**
A list of projects and publications.

b Boltz, D. F. (Editor).
Colorimetric determination of nonmetals.
Interscience Publishers, Inc., New York and London, 1958, 9½ × 6½ in., pp. 372, bibls, illus., 72s.
Dealing individually with the elements P, Si, N, Cl, Br, I, F, S, Te, Se and B.

c Commonwealth Institute of Biological Control (Thompson, W. R.).
A catalogue of the parasites and predators of insect pests. Section 2. Host parasite catalogue. Part 5. Hosts of the Hymenoptera (Miscogasteridae to Trigonalidae), Lepidoptera and Strepsiptera, 1958, 11 × 9 in., pp. 698, Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, 30s.

d Dominica.
Annual Report of the Department of Agriculture and Forestry for 1956 and 1957, pp. 23.

e FAO.
Trade Yearbook 1958, Vol. 12. [English, French and Spanish.] FAO, Rome, 1959, pp. 321, $3.50 or 17s. 6d.
Title changed from Yearbook of Food and Agricultural Statistics, Part 2.

Goodey, J. B., Franklin, M. T., and Hooper, D. J.
Supplement to "The nematode parasites of plants catalogued under their hosts, 1955-1958."
[*Publ.*] *Commonw. Bur. Helminthol.*, 1959, 9½ × 7 in., pp. 66, bibl. pp. 11, Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, 7s. 6d.
Bringing the useful catalogue described in *H.A.*, 26: 4260 up to date; horticultural crops are of course included.

g Hong Kong.
Annual Departmental Report of the Director of Agriculture, Fisheries and Forestry, Hong Kong, for 1957-58, pp. 128, illus., $4.
Including fertilizer, cultural and variety trials of vegetables.

h Imperial College of Tropical Agriculture.
Report of the Governing Body and the Principal's Report for 1957-58, 1959, St. Augustine, Trinidad, and 40 Norfolk St., London, W.C.2, pp. 64, illus.
Including brief accounts of current cacao and banana research.

i Kansas.
Nineteenth Biennial Report of the Director, Kansas Agricultural Experiment Station, Manhattan, 1956-58, pp. 48.
Lists of projects and publications.

j Lawalrée, A., and Legrain, J.
Flore générale de Belgique. Spermatophytes. Vol. III. Fasc. II: Rubus. **(A general flora of Belgium. Spermatophytes. Vol. III, Part II: *Rubus.*)**
Minist. Agric. Jardin bot. État, Brux., 1959, 10 × 6½ in., pp. 306, illus.
See *H.A.*, 28: 4200 l for Part I of Vol. III.

k Luck, J. M., Allen, F. W., and Mackinney, G.
Annual review of biochemistry, Vol. 28. Annual Reviews, Inc., California, 1959, pp. 698, bibls, $7 in the U.S.A., $7.50 elsewhere.

l Macaulay Institute for Soil Research.
Annual Report of the Macaulay Institute for Soil Research for 1957-58, Craigiebuckler, Aberdeen, pp. 55.

m Ministry of Agriculture, London.
Department of Agriculture, Scotland.
Ministry of Agriculture, Northern Ireland.
Agricultural Statistics 1957-58, H.M.S.O. London, 1959, pp. 38, 3s. 6d.
Including acreage and production figures for fruit and vegetables.

n Nebraska.
71st Annual Report of the Nebraska Agricultural Experiment Station, 1957, 1958, pp. 30.
Lists of projects and publications.

o New Hampshire.
Report of the Director of the New Hampshire Agricultural Experiment Station, 1955-56, being *Stat. Bull.* **442**, 1957, pp. 15.
Projects, services, personnel and publications.

p New York State.
Seventy-seventh Annual Report New York State Agricultural Experiment Station, Geneva, 1958, 1959, pp. 26.
Lists of publications and projects.

q NORTH CAROLINA.
Annual Report of the School of Agriculture, North Carolina State College, 1958, 1959, pp. 32, illus.
Includes brief, illustrated notes on quality assessment and bulk flue-curing of tobacco.

r NORTHERN RHODESIA.
Annual Report of the Northern Rhodesia Department of Agriculture for 1958, Lusaka, 1959, pp. 22, 2s. 6d.

s SCOTLAND, DEPARTMENT OF AGRICULTURE.
Agriculture in Scotland. The Report of the Department of Agriculture for Scotland for 1958, H.M.S.O. Edinburgh, 1959, pp. 107, illus., 6s.
Includes a brief note on bulb growing as a new crofting occupation.

t STAHL, C.
Beretning fra Statsfrøkontrollen for det 87. arbejdsår fra 1. juli 1957 til 30. juni 1958. **(Eighty-seventh Report of the Danish Seed Testing Station for the year 1st July, 1957, to 30th June, 1958.)** [English summary 2 pp.]
Tidsskr. Planteavl., 1959, **62**: 773-840.

u U.S. DEPARTMENT OF AGRICULTURE.
Workers in subjects pertaining to agricult in land-grant colleges and experiment statio 1958-59.
Agric. Handb. U.S. Dep. Agric. **116,** 19 pp. 244, 65 cents.

v UNIVERSITY OF NOTTINGHAM.
Report of the School of Agriculture, 19 1959, pp. 68, bibls, illus.
Work of the Department of Horticultu briefly described [see also separate abstract

w WASHINGTON STATE.
67th Annual Report of Washington Agr cultural Experiment Stations, Institute Agricultural Sciences, for 1956-57, 1957, p 53, being *Bull.* **582.**
Lists of projects and publications.

x WATERSCHOOT, H. F.
Report to the Government of India on t improvement of fruit production in the Sta of Himachal Pradesh.
Rep. FAO **873**, Rome, 1958, pp. 17.
Mainly temperate top and soft fruits.